NAL

OF THE

ROYAL ASIATIC SOCIE

OF

GREAT BRITAIN AND IRELAND.

JOU/R
1846

VOLUME THE EIGHTH.

LONDON:
JOHN W. PARKER, WEST ST
MDCCCXLVI.
[illegible]

CONTENTS OF VOLUME

ORIGINAL COMMUNICATIONS.

Art. I.—On the Geographical Limits, History, and Chronology o Chera Kingdom of Ancient India. By **Mr. J. Dowson** .

Art. II.—On the Rock-Cut Temples of India. By **James Fergusson, Esq.** 30

Art. III.—Notes on Indian Agriculture, as practised in the Western or Bombay Provinces of India. By **Alexander Gibson, Esq.**, Superintendent of the Botanic Garden of Daporee . . 93

Art. IV.—A Letter to **Richard Clarke, Esq.**, Honorary Secretary to the Royal Asiatic Society, on the Oriental MSS. in the Library of Eton College 104

Art. V.—Abstract of a Discourse, by **Dr. Falconer**, on the Fossil Fauna of the Sewalik Hills 107

Art. VI.—On the Identification of the Mustard Tree of Scripture. By **J. Forbes Royle**, M.D., F.R.S., L.S., and G.S., &c., Professor of Materia Medica and Therapeutics, King's College, London . 113

Art. VII.—Summary of the Geology of Southern India. By **Captain Newbold**, F.R.S., &c., Assistant Commissioner for Kurnool . 138

Art. VIII.—A few Observations on the Temple of Somnath. By **Captain Postans** 172

Art. IX.—Report on some of the Rights, Privileges, and Usages of the Hill Population in Meywar. By **Captain W. Hunter**, of the Meywar Bhîl Corps 176

Art. X.—On the Hyssop of Scripture. By **J. Forbes Royle**, M.D., F.R.S., L.S., and G.S., &c., Professor of Materia Medica and Therapeutics, King's College, London . . . .

Art. XI.—Summary of the Geology of Southern India. By **Captain Newbold**, F.R.S., &c., Assistant Commissioner for Kurnool

Art. XII.—The Chenchwars; a wild Tribe, inhabiting the Forests the Eastern Ghauts. By **Captain Newbold**, F.R.S., Assistant Commissioner for Kurnool. . . .

Art. XIII.—Account of Aden. By **J. P. Malcolmson, Esq.,** Staff Surgeon . . . . .

CONTENTS.

PAGE

of an Excursion from Pesháwer to Sháh-Báz sson, Esq. 293

-di-Giri Rock Inscription. By Mr. E. Norris 301
r 308

ern India 315

sis of the Ganesa Purána, with special reference to y of Buddhism. By the Rev. Dr. Stevenson . 319

.—The Ante-Brahmanical Religion of the Hindus. By the v. Dr. Stevenson 330

XVIII.—Memorandum on certain Fossils, more particularly a new Ruminant found at the Island of Perim, in the Gulf of Cambay. By Albemarle Bettington, Esq., of the Bombay Civil Service, F.G.S., M.R.A.S. 340

Art. XIX.—Extract from a Letter addressed by Professor Westergaard to the Rev. Dr. Wilson, in the year 1843, relative to the Gabrs in Persia 349

Art. XX.—Visit to the Bitter Lakes, Isthmus of Suez, by the bed of the ancient Canal of Nechos, the "Khalij al Kadim" of the Arabs, in June, 1842. By Captain Newbold, F.R.S. 355

Art. XXI.—On the Secret Triad Society of China, chiefly from Papers belonging to the Society found at Hong Kong. By the Rev. C. Gutzlaff 361

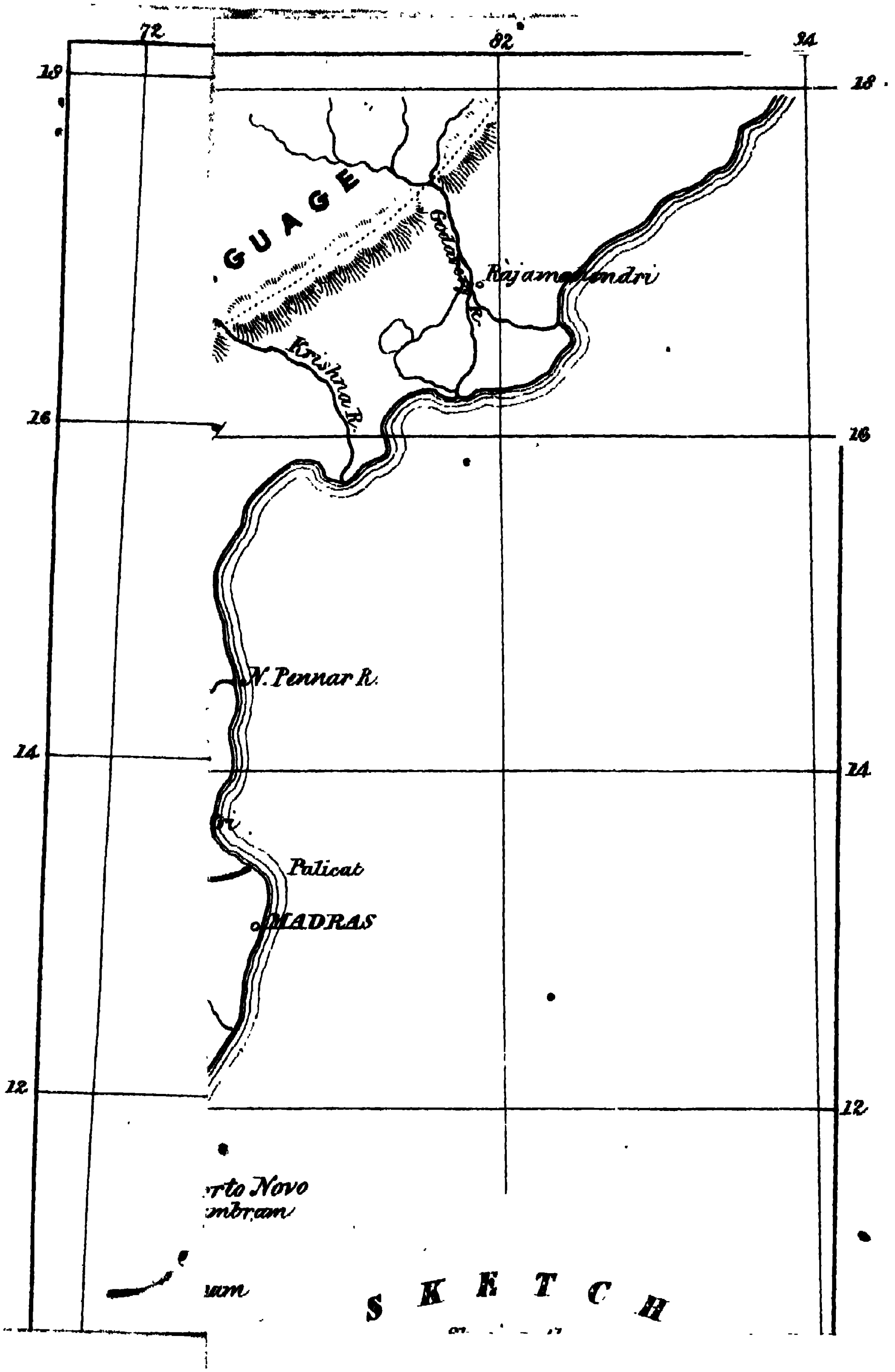
Art. XXII.—The Cinnamon Trade of Ceylon, its Progress and Present State. By John Capper, Esq. 368

Art. XXIII.—Reports on the Manchur Lake, and Aral and Narra Rivers. By Captain Postans, and R. C. Knight, Esq., communicated by Captain Postans 381

Art. XXIV.—On the traces of Feudalism in India, and the condition of Lands now in a comparative state of Agricultural Infancy. By the late Augustus Prinsep, Esq. 390

t. XXV.—Extracts from a Report on Chota Nagpore. By S. T. Cuthbert, Esq., Magistrate, Ramghur 407

otes on the Perim Fossil. By Professor Owen . . . 417


72
82
84
18
18
16
16
14
14
12
12
GUAGE
Godav R.
Rajamahendri
Krishna R.
N. Pennar R.
Palicat
MADRAS
rto Novo
mbram
am
SKETCH

JOURNAL

OF

THE ROYAL ASIATIC SOCIETY.

ART. I.—*On the Geographical Limits, History, and Chronology of the Chera Kingdom of Ancient India, by* MR. J. DOWSON.

TRADITION and native records represent the southern portion of the Indian peninsula as being anciently divided into three contemporary kingdoms. 1. The Pándya. 2. Chola or Sora. 3. Chera, Sera or Konga. Of the first, a valuable account has been supplied by Professor Wilson, in Vol. III. of the Society's Journal[1]; and of the other two, slight sketches have been given by the same learned writer, in the Introduction to his Catalogue of the M'Kenzie Collection: a more detailed notice of the last is the object of this paper.

The notices of this kingdom which have been published, have been drawn chiefly from a Tamil memoir, in the M'Kenzie Collection, called "Konga desa Charitra," or "Konga desa Rájákkal," of which a translation exists in the Library at the East India House; it has been noticed, in Professor Wilson's Catalogue, at p. 199, Vol. I., and in page 1 of the Rev. W. Taylor's Analysis of that Collection.

This Memoir gives the history of the Chera dynasty, of those Chola monarchs who held the country of Chera by conquest, and also of the Hoyisála or Bellála and the Vijayanagara dynasties, into whose power it successively fell. It is the only paper in the collection from which any useful notices of the Chera monarchs can be obtained, and the history of that dynasty rests at present mainly upon it. In style it is stated to be very different from the generality of Hindu writings of this class, and independently of its being our only authority, it merits a fuller notice than has yet been given of it. From the before-mentioned translation, the following Abstract of the first portion which relates to the Chera dynasty and its Chola conquerors, has been prepared, in which all important and useful information on that subject has been retained; the parts relating to the Bellála and Vijayanagara kings will be useful in any future accounts of those dynasties, but are unnecessary for our present purpose.

The Rev. W. Taylor speaks of this memoir in high terms of commendation: he made a translation of the whole of it, which he intended for insertion in the "Journal of the Bengal Asiatic Society;" it has however never appeared. In his Analysis of the M‘Kenize Collection, he says it "is for the most part free from the mythological fable which usually disfigures Hindu documents, and is well supported by dates, in general referred to inscriptions which are mentioned, and many grants of land are specified with such reference. On the whole this is one of the best, and most valuable manuscripts in the collection." In qualification of this praise however, it must be observed that, the accounts it gives of the Hoyisála and Vijayanagara kingdoms differ in some instances from others, particularly in reducing the number of kings; and that implicit credence cannot be given to the dates in the first Part, will be seen from the observations which follow the Abstract; those of the second and third Parts appear to be tolerably correct.

The translation of this document in the volume of MSS. at the India House, is preceded by an introductory note, and an analysis of the first part relating to the Chera desa; to these no name is attached, but they are evidently the work of an European. The introductory matter supplies some valuable geographical information, which has been incorporated into the following observations upon that subject.

We will now give the abstract of the memoir, reserving further comment for the inquiry which will follow it.

1. The first king, named Sri Víra Rája Chakravartí, was born in the city of Skandapura, and was of the Reddy[1] or Ratta tribe (culam), and of the Súrya vamsa (solar race); he obtained the government of the country and ruled with justice and equity.

2. Govinda Ráya, son of Víra Rája, was the next king.

3. Krishna Ráya, son of Govinda Ráya, ruled next.

4. Kála Vallabha Ráya, son of Krishna Ráya, was next in succession.

Of these kings nothing more than their equity, justice, and renown is recorded.

5. Govinda Ráya, son of Kála Vallabha, was the fifth in succession; he conquered the hostile rajas, exacted tribute from them, and ruled his country with justice and renown. This king made a grant of land to a Jaina Brahman, named Aristánan, for the performance of worship in the Jaina basti (temple) of Kongani Varma, in Vaisákha, A. Sál. 4,—year of the cycle, Subhánu (A.D. 82).

6. Chaturbhúja Kanara Deva Chakravartí succeeded; he was of the

---

[1] A Telugu tribe. See Ellis's Mirasi Right, p. xii.

same race, but his parentage is not mentioned. He is stated to have had four hands[1]; he was versed in the art of archery and various sciences, and ruled with equity and renown, "obtaining the honorary insignia of all the other rájas."

A jaina named Nága Nandi, a learned and venerable man, was minister to the three last named rajas.

7. Tiru Vikrama Deva Chakravartí I., son of Chatúrbhúja Kanara, succeeded, and was installed in A. Sál. 100 (A.D. 178), at Skandapura. The celebrated Sankaráchárya (called in the MSS. Sankara Deva) came to this king and converted him from the Jaina to the Saiva faith. After his conversion he marched into the southern country and conquered the Chola, Pándya, Kerala, and Malayálma countries, after which he returned. He made many grants in charity and in encouragement of the learned; a deed of grant, dated Vaisákha-sud A. Sál. 100,—year of the cycle, Sidhárthi (A.D. 178), to Narasimha Bhatt, Guru, of the Bharadwája gotra, is stated to be in the temple of Sankara Deva, at Skandapura. This king governed the Karnáta as well as the Konga desa.

8. Kongani Varma Ráya succeeded; he was of the Konávar or Konváyan tribe and Ganga kula, and was installed at Vijaya Skandapura in A. Sal. 111,—year of the cycle, Pramodúta (A.D. 188), and reigned for fifty-one years; he exacted tribute from many rájas whom he conquered, and "by his munificence and charity cleared away the sins of his predecessors of the Ganga race;" his title was Srimat Sampati Kongani Varma Dharma Mahádhi Ráya.

9. Srimat Mádhava Mahádhi Ráya, son of Kongani Varma, succeeded, and was installed in the government of the Konga desa, at Skandapura; he was learned in all the sciences and maxims of justice, ruled with equity, and was renowned for his munificence to the learned and the poor.

10. Srimat Hari Varma Mahádhi Ráya, son of Mádhava Ráya, succeeded; he was installed at Skandapura, but "resided in the great city of Dalavanpura, in the Karnáta desa." He exacted tribute from many different rájas, and was renowned as an eminent hero among all kings; he ruled according to the maxims of polity, and being very wealthy made many grants of land, one of which is recited, viz., a grant of land in Tagatúr, a petta (suburb) of Tálakád to the Brahmans for the worship of Múlasthán Iswara in that place, dated Panguni, A. Sal. 210,—year of the cycle, Saumya (A.D. 288).

---

[1] The writer of the MSS. has evidently understood the title *Chatur-bhúja*, "four armed," as having a personal and literal reference to this prince; it is however a title of Vishnu, which is frequently assumed by his followers.

11. Vishnu Gopa Mahádhi Ráya, son of Hari Varma, succeeded, and was installed at Tálakád or Dalavanpura; he conquered the *Púrva-dik* (eastern country) and was renowned as a great warrior; he made many grants to Brahmans and to the poor, and being a zealous votary of Vishnu, erected many temples to that deity; hence he derived his name of "Vishnu Gopa." "The Konga and Karnáta desas were both under his command:" having no children he adopted a lad of his own race, named him Mádhava, and resigned the crown to him.

12. Mádhava Mahádhi Ráya, adopted son of Vishnu Gopa, was installed at Dalavanpura, and ruled for some time under the orders of his father; but a son being born to Vishnu Gopa, that son was installed in the government.

13. Krishna Varma Mahádhi Ráya, son of Vishnu Gopa, was installed at Dalavanpura, and on that occasion he granted some "countries near the Kanavái and the mountains to his adoptive brother, Mádhava Mahádhi Ráya, who had lately ruled;" he governed the kingdom equitably; he was a zealous votary of Siva, and having set up a Linga at Dalavanpura granted some lands for its support: he had no son.

14. Dindikára Ráya, son of Kúláti Ráya, of the family of Vishnu Gopa's adopted son Mádhava, ruled for some time, but was deposed by he Mantri Senápati of the late rája, who installed

15. Srimat Kongani Mahádhi Ráya, son of Krishna Varma's younger sister, in A. Sál. 288,—year of the cycle, Parábhava (A.D. 366). This prince was learned in sciences and in languages, "he conquered all the desas and took tribute from their rájas," and granted many charities. A person named Yárachandra Dindikára Ráya, who had some desas under his charge during the reign of this king, made a grant of the village of Parola-kanúr near Alúr gráma.

16. Dúrvanítí Raya, son of Kongani Raya II., succeeded and ruled the Konga and Karnáta desas. This prince is represented to have been deeply versed in magic and the use of mantrams; by repeating the mystical word OM when his enemies were drawn up against him, they were enervated and dispirited, so that he obtained easy victories over them. He conquered the countries of Kerala, Pándya, Chola, Drávida, Andhra, and Kalinga, and exacted tribute from the rajas thereof; all hostile kings were afraid of him, and hence he was called Doony Veeroota Ráya (Dharma virodhi, or Punya virota) the unjust Ráya.

17. Múshakára Ráya, son of Dúrvanítí, succeeded, he was learned in the military art, and took tribute from those rájas whom his father had conquered, keeping them in subjection and fear. He resumed the

grants which had been made to the Brahmans and the poor; and hence he obtained the title of Brahmahatya Ráya.

18. Tiru Vikrama II., son of Múshakára, succeeded; he was a learned man and well versed in the science of government; "he obtained possession of all the desas," and ruled them with justice.

19. Bhú Vikrama Ráya, son of Tiru Vikrama succeeded, and was installed in A. Sál. 461,—year of the cycle, Sidhárthi (A.D. 539). He ruled the two countries of Konga and Karnáta, and conquered many other countries. From the great number of elephants which he procured, the title of Gajapati was given to him; he had several weapons made of ivory which he kept by him as trophies of victory. He maintained all the charitable and religious grants which had been made by his ancestors in the countries which they had conquered, as well as in the Chera and Karnáta countries.

20. Kongani Mahádhi Ráya III., succeeded his father Bhú Vikrama, and governed the countries with justice and equity. He made his brother commander of his armies, and several rájas having refused to pay tribute, he collected his armies and conquered the Chola, Pándya, Drávida, Andhra, Kalinga, Varada, and Maháráshtra desas, as far as the Nerbadda river, and took tribute from them; he then returned to his capital, Dalavanpura, which he strongly fortified, and made many benefactions. The title of Bhú Vikrama Ráya was taken by him. He acted in these campaigns, and in the government of the country, under the advice of his youngest brother Vallavagi Ráya.

21. Rája Govinda Raya succeeded his father, and ruled the country with equity and renown, subduing all the hostile rajas. He was "esteemed a most pure person in the Gangakula," and from his attachment to the Lingádhárí sect, was called Nandi Varma. This prince resided for some time at the city of Muganda-pattana.

22. Sivaga Mahá Ráya, brother of Govinda Ráya, succeeded; he was installed at Dalavanpura, but resided for some time at Muganda-pattana, ruling the kingdom justly. In A. Sál. 591,—year of the cycle, Pramodúta (A.D. 668), he made a grant of the village called Halihalli to a learned Brahman of Drávida desa.

23. Prithiví Kongani Mahádhi Ráya, grandson (son's son) of Sivaga, succeeded; his commander-in-chief, Purusha Ráya, conquered the hostile rájas, and the king conferred upon him a grant of twelve villages near Skandapúra, and the title of Chavurya Parama Narendra Senádhipati, in Cháitra, A. Sál. 668,—year of the cycle, Párthiva (A.D. 746). This king ruled the country in felicity, and was known by the title Siva Mahá-rája.

24. Rája Malla Deva I., son of Vijayáditya Ráya, younger brother of

Prithiví Kongani Ráya, succeeded, and ruled the Konga and Karnáta desas. This prince always dressed with magnificence and elegance. He is recorded to have made a grant to his Senádipati "of twelve villages belonging to Vijaya Skandapura, situated above the Kanavái, along with Vijaya Skandapura." The mantris of his tribe, the nobility, and the Mallikárjuna Swámí, were declared witnesses to the grant.

25. Ganda deva Mahá-ráya, son of Malla-deva, succeeded; he was a powerful prince, and obtained the different insignia of all the rajas. He fought with the Drávida Raja in Kánchi desa, defeated him and exacted tribute from the country; he fought also with the Chola Raja, "into whom he carried terror, and afterwards established amity with him." He maintained a friendship with the Pándya Raja, and was renowned among the Ganga-kula for protecting the kingdom.

26. Satya Vákya Ráya succeeded his father Ganda deva, and ruled the kingdom in equity and justice, punishing the wicked and protecting the good. He was never failing in truth, hence he obtained the title of Satya Vákya Ráya (the truth-speaking king).

27. Gunottama Deva, brother of Satya Vákya, was installed at Dalavanpura; he ruled the kingdom in an equitable manner, allowing many charities, and maintained friendship with the other rájas.

28. Malla Deva Ráya II., younger brother of Gunottama, succeeded during the life-time of the latter, whom he is stated to have kept at Vijaya Skandapura. This king was a very valiant man and defeated the Pándya Raja, who had attacked him.

In the reign of this prince, his brother Gunottama made a grant of land in Ani, A. Sal. 800,—year of the cycle, Vikari (A.D. 878), to a Jaina, for the performance of worship to a Jaina deity.

On the 7th Vaisákha sud, A. Sal. 816,—year of the cycle, Ananda (A.D. 894), a person named Tirumalayan, built a temple, and to the west of it erected an image of Vishnu, which he called Tirumala Deva, upon some land "in the midst of the Cávéry," where in former times the western Ranganád Swámi had been worshipped by Gautama Rishi, but which was then entirely overrun with jungle. This place he called Srí Ranga pattana (Seringapatam).

CHOLA CONQUEST.

29. Vijaya Ráya Aditya Varma, son of Vijayada[1] Ráya, who had been installed at Tanjore as King of the Chola-desa, came into the Chera-desa, conquered the "Vedar[2]" Rajas thereof, reduced the capital

---

[1] The introductory note calls him "Virata."

[2] A tribe of hunters, said to be the aborigines of the peninsula.

Tálakád, and governed the country. He made many charitable grants in Chera.

30. Vira Chola[1] Ráya, son of Aditya Varma, was installed at Tanjore, and became King of the Chera and Karnáta desas. He was a very valiant man and conquered many desas; hence he obtained the title Víra (hero), and from being a zealous follower of Vishnu he was called Náráyana; thus, Víra Chola Náráyana. "He and the Pándya Raja both conquered many desas; he went to Sinhala desa and conquered the raja thereof, thereby obtaining great fame." He granted many agrahárams in free gift to Brahmans; one situated on the banks of the Cávéry in Chola-desa, was named Víra Náráyanapur. He one day saw on the sea-shore the Sabhápati of Chillambara (Siva), attended by Párvatí, dancing and beating the damaraka (a kind of drum); he therefore expended great sums of money in building the Kanaka or golden Sabhá. Having many sons, he appointed Dásoditya Ráya to be King of the Chola-desa, and Arunjeya Ráya to the Drávida desa, and died.

31. Dásoditya Ráya was installed at Tanjore, and then performed the installation of his elder brother, Arunjeya Ráya, as King of the Drávida desa. He ruled the Chera country in an equitable and charitable manner; he granted four agrahárams on the Cávéry, and named them Chatur samudram; he died childless.

32. Parandaka Ráya, son of Dásoditya's brother Arunjeya, conquered the Pándya raja and took tribute from him. He married a virgin named Chittiri, daughter of Chati Ráya; by her he had a son, who having conquered many enemies, was called Arimalli; he died before his father, who by the same wife had many other sons. This king granted many agrahárams, and other charities.

33. Divya Ráya, son of Parandaka, succeeded, and ruled the Drávida, Chera, and Karnáta desas. He was alarmed by Víra Pándya, who came to Tanjore to fight, but defeated him and cut off his ears, upon which the Pándya Raja returned to Madura; from this feat he was called Arititu Ráya. He then went to conquer the Uttara desa (northern country), leaving his mantri in charge of the public affairs at Tanjore, but remaining absent a long time, quarrels arose between his relations and the mantri, whose authority was unheeded; upon hearing of which, he returned and restored tranquillity, and punished those who had rebelled. After this he conquered Satya Kánakár, of the Vaitonda vamsa, and despoiled him of a great quantity of precious stones, which

---

[1] A note in the MSS. states, that "according to the Condatoor MSS. he reigned from Saliváhana 849 to 899 (A.D. 927 to 977)."

he gave to the Brahmans in charity, in order to obtain the favour of Náráyana. He caused many canals on the Cávéry to be dug, and made many charitable grants; he had no sons, he therefore installed his younger brother, Ari Vari Deva.

34. Ari Vari Deva, brother of Divya Ráya, ruled the desas of Chola, Drávida, Konga, and Karnáta. His brother, Divya Ráya, marched with an army to Madura, defeated the Pándya Raja, and forced him to take flight: he then reduced the Pándya-desa, and having plundered Virenjipuram[1] returned to Tanjore. The mother of the defeated and fugitive Pándya Raja, being a near relative to the Chola Raja, the latter, after having received large quantities of jewels and money, restored Madura to the Pándya king, and lived afterwards in amity with him. "The Senádhipati (commander) of the Pándya Raja, who was a near relation, came to the Chola Raja;" his name was Amra Bhojangan, and the king being pleased with him gave him the command of an army, with which he marched as far as Saha parvata to the west, and from thence into the Kerala desa, the raja of which attempted to defend the country, but Amra conquered the Kollúr, Indra-giri, and Nila-giri countries; "and that raja having lost everything, and being defenceless, embarked on ship, and fled to the islands in the midst of the ocean." By command of his master, he buried all the treasures, jewels, and whatever he had plundered, in the Kanavái sthala of Siva; Bhíma Ráya, having heard of these events, attacked him, but was defeated, and lost his son. Amra then marched into the Kalinga desa, and took tribute from the rája, and proceeded from thence to the Narmada river, where he conquered many rajas; having subdued Vaitonda Ráya, Kámaranava Ráya, Dana Pallia Bhíma Ráya, and Amán Ráya, and taken from them money, jewels, the ladies of their palaces and tribute, he returned to the raja, bringing among the plunder the golden statue of Bhíma Ráya, having planted the "victorious tiger-standard" in the Pushkama-dik (western country), on the Narmada river and on Mahendra-giri. The raja was highly pleased on seeing the treasures, and observing that his grandfather had built only a Kanaka Sabhá to the Chillambara deity (Siva); he built Gopuras (spires, towers), Maddals, (inclosures), Mandapams (image-houses), and Sabhás (holy places or apartments), and granted many jewels to the deity. He resided at Tanjore, and ruled both the Konga and Karnáta desas, making numerous grants of land and other donations. He made a grant of the village of Káriyúr, in Tálakád, to the north of the Chera desa, in agrahâram to the Brahmans of Tálakád, placing Vaisyas

---

[1] There is a place of this name in the Drávida desa; it is situated a little to the west of Vellore.

there seems to be good reason for giving it to Ari Vari deva (No. 34). It must be observed, that the thirtieth king is called in our list Víra Chola and Víra Chola Náráyana, and as before-mentioned we have notice of a grant in which he is known by the latter title; the word "deva" nowhere occurs in connection with his name; but in Ari Vari *deva* we have it distinctly, the name Ari Vari being possibly a different appellation, or a wrong rendering of "Hari Víra." This grant of Tribhúvana Víra-deva Chola informs us, that he "triumphed over the crowned head of Pándya," this could hardly apply to the Víra Chola (No. 30) of our list, for it may be inferred from the remark of our MSS., which says, "he and the Pándya Rája both conquered many desas," that Víra Chola was in alliance with the Pándya king; the statement, however, is perfectly applicable to Ari Vari deva. The Víra deva of the grant, was according to Mr. Ellis, fifth in succession from Rájendra, and Ari Vari deva is in our MSS. fifth in succession from Vijaya Ráya Aditya, whom we have endeavoured to identify with Rájendra. If the list upon which Mr. Ellis stated that Víra deva was the fifth prince after Rájendra be correct, the date of the grant will also agree with the era of Ari Vari deva; it is dated in the thirty-seventh year of the reign, and Mr. Ellis, reckoning at the rate of eighteen years for each of the four kings intervening between Rájendra and Víra deva, and adding the total to A.D. 886, the date of Rájendra as given by Camban, places Víra deva's accession in A.D. 958; adding to that thirty-seven years for the grant, we arrive at A.D. 995. In this calculation, Mr. Ellis has allowed no time to Rájendra after Camban's presentation of his poem in 886, but as we have evidence from a grant that Rájendra reigned thirty years, and as Camban appears, as before observed, to have presented his poem shortly after Rájendra's accession to the Chola throne, it will not be unreasonable that, placing the time which Rájendra may be supposed to have reigned after the grant, dated in the thirtieth year of his reign, against that which had elapsed before the date given by Camban, we should add the whole thirty years of Rájendra's grant to this calculation, which will bring us down to 1025; and Ari Vari Deva, as will be presently shown, died in 1058.

Two important inscriptions of the Chalukya dynasty, procured by Mr. Walter Elliot, and described in the Society's Journal[1], throw some light upon the portion of our MSS. which relates to Ari Vari deva. These inscriptions are dated Sal. 981 and 993 (A.D. 1059 and 1071); the first is a grant by the Chalukya sovereign, Someswara I., who is styled "the Narendra of the Chola race," of some lands at Savanur to his general upon the latter's returning from a successful attack upon the Chola kingdom; the general is styled the humbler, among other persons and places, of Bhujánga. The second inscription, which explains the reason of the attack upon the Chola dominions, mentioned in the first inscription, is a grant to a new temple at Pulikara nagara, now Lakmeswara; the former temple is said to have been destroyed along with many other Jaina temples, by "the outcast Pandi Chol, who had forsaken his usual course, and left off practising the virtue of his race," in an invasion which he made upon the Belavel desa, or level lands of Karnáta, belonging to the Chalukya monarch; it also informs us, that he was afterwards defeated and killed by the Chalukya forces. This attack upon the Chalukya dominions, is evidently part of the expedition which our MSS. attributes to Ari Vari deva, and the Bhujánga, who was conquered, is clearly the Amra Bhojánga of our MSS. general of the Chola forces, who is stated to have come over to that king from the Pándya ruler; this circumstance, and the amity which existed in the latter part of Ari Vari's reign between the Pándya and Chola kings, may have led to the latter being called in the above cited inscription "Pandi Chol." The Chola monarch who was killed, appears from the inscriptions to have been he who made the attack, and as the inscription which first records the victory is dated 1059, we must place the death of Ari Vari deva in A.D. 1058. Our MSS. assigns no reason for not continuing the history of the Chola kings after Ari Vari deva, but commences immediately upon the Bellála dynasty; the loss of the Chera and Karnáta desas, was undoubtedly the cause of this cessation in its notice of the Chola Rájas, and these inscriptions satisfactorily account for the loss.

---

[1] Vol. iv., p. 13.

Our MSS. mentions a grant by Ari Vari deva in A.D. 1004, which would show him to have reigned fifty-four years, if we are right in placing his death in 1058; his reign, as shown by the grant of "Víra deva," and the magnitude of his expeditions, must certainly have been a long one.

Considering then the year A.D. 1058, as conclusively determined to be that of Ari Vari's death, we may endeavour to measure the others by it, with the view to ascertain the time of the conquest of Chera by the Chola kings; reckoning backwards from A.D. 1058, and allowing

	Years.
To Víra deva (Ari Vari deva) according to his grant	37
To Divya Ráya from his grant	20
To Rájendra according to his grant thirty years after Camban's date 886, leaving for his reign after A.D. 900	16
And eighteen years to each of the other three kings	54
Total	127

That about the year A.D. 900, or a little later, their possessions were conquered and annexed to the Chola dominions, under which dynasty they continued for upwards of a century until A.D. 1058. That the Chola princes must, during the subjugation of these countries to their rule, have been very powerful; their neighbour, the Pándya king, appears to have held his throne towards the end of the period, most probably as a tributary prince. That they undertook maritime aggressions upon the island of Ceylon, and that they carried their arms a considerable distance to the northward of Chola, is clear from the Chalukya inscriptions, which represent them as destroying the Jaina temples at Lakmeswar[1]. Their attack upon the dominions of the Chalukya princes professing the Jaina faith, and the destruction of the Jaina temples, appears to have aroused both political and religious feelings against them, and to have led to an attack upon them by the Chalukya dynasty, which ended in the death of the Chola king, and the loss of those districts which form the subject of the present paper. The cessation of any notice in our MSS. of the Chola monarchs after Ari Vari deva is sufficient to satisfy us that he was the last Chola king who governed the Chera and Karnáta desas; and the Chalukya inscriptions clearly point out the reason for the loss of those countries, which our MSS. had left unexplained.

The confusion which must necessarily have followed such a signal victory as the Chalukya inscriptions commemorate, led to a total disregard of any superior power by the chieftains of the Chera and Karnáta desas; for the continuation of our MSS. informs us, that those provinces were in the "possession of Poligars, who lately were paying tribute to the Chola Rajas:" such a state of things was not likely nor destined to last long, for a dynasty arose from the anarchy, which ruled the centre of the peninsula for two centuries and upwards; this was the Bellála or Hoyisála dynasty, the founder of which appears to have established himself at Tálakád, and although considerable opposition would seem to have been given to him, his power became pretty firmly established in a few years, for we have a grant of this dynasty dated A.D. 1069[2]. Karnáta and part of the Chera desa were the chief possessions of this line of princes.

---

[1] Lakmeswar is a little to the south-west of Dharwar, in the southern Mahratta country.

[2] Wilson's M'Kenzie Catalogue, vol. i., Int. p. cix.

APPENDIX.

NOTE.—*In the following lists the original orthography has been retained.*

1. List of Chera Kings from "The Vamsavali, or Genealogical Account of the Dynasties of the Chola, the Chera, and the Pandya Kings." Wilson's M'Kenzie Catalogue, vol. ii., p. cxxviii., No. 1.

It gives first a list of thirty rajas who lived in the first ages of the world, and then the following list of those who reigned in the Kali age.

1. Austaya Pauttora Cheran.
2. Yanauthe Pauttora Cheran.
3. Vamsa Paripaulaka Pauttora Cheran.
4. Mungalakauma Pauttora Cheran.
5. Seevadurma Mottark.
6. Seelana.
7. Seevapava.
8. Sindoo Lauraneya.
9. Yalavajana Sumrastaka.
10. Teerka Yauttaura.
11. Teerta Chatta Cheran.
12. Auchoota Pratapa.
13. Aucondita Creety Pratapa.
14. Vira Rajendra.
15. Bhimeswara.
16. Neroomala Sakara.
17. Punjaustara.
18. Jeeva Pautaka.
19. Tiroomunja.
20. Kylasatta Audunga.

2. List of Chola Kings from the same paper; forty-eight ruled before the Kali age, and the following eighteen after.

1. Poonderick Cholan.
2. Neelama Chamala vurna.
3. Daunavaraury.
4. Bhoopaurum Titta.
5. Poovel Vunda.
6. Punna Sabiya Cara.
7. Pauracoorumma.
8. Manoomeely Yetta.
9. Chuntra Cooladhi.
10. Sansara Soodamany Cholan.
11. Nauga logam Conda.
12. Audakeswara.
13. Cuncaupautarumen.
14. Cuncoodaumany.
15. Woottoorocau.
16. Sattooroo Staya.
17. Creemeecutta.
18. Caunpraya.

3. List of Chola Kings from a "Varalar, or Chronological Account of the Kings of the Kali Yug." Wilson's M'Kenzie Catalogue, vol. ii., p. CLVI., No. 24.

	Reign.	Sal.
1. Kerikala		
2. Mandurantaka		
3. Poowa Chola		
4. Pedda Chola .	7	56
5. Siddi Bhoopala .	21	77
6. Toyabeema .	30	107
7. Tommasiddoo .		112 to 178

		Reign.	Sal.
8.	Teranda Cholan	20	198
9.	Keleganda	21	219
10.	Chinna Pellan	40	259
11.	Matwa Maha Raja	40	299
12.	Deva Chola	60	359
13.	Mumedyganda Chola, alias Trigasy Raja	50	409
14.	Raja Caseree	70	479
15.	Cheren Chola	80	559
16.	Pudma Caseree	50	609
17.	Rajadi Raja	60	669
18.	Vikrama	80	749
19.	Culottunga	40	789
20.	Rajendra (son-in-law)	60	849
21.	Vira Chola	50	899
22.	Vishnu Varma, or Vishnu Bellala	41	940
23.	Deva Bellala, or Pullan	40	980
24.	Hrudia Pullan	40	1020
25.	Jayasinha	51	1071
26.	Chundrasinha	38	1109
27.	Neelakunta	40	1109

"Then commenced the Rayars."

4. List of Chola Rájas procured from a village Accountant, by Mr. Buchanan. Buchanan's Journey, vol. iii., p. 472. Prinsep's Tables, No. xl., p. 119.

1. Utinga Sholun.
2. Culatunga Sholun.
3. Rajendra Sholun.
4. Tiramudi Canda Sholun.
5. Carical Sholun.
6. Arundavan Sholun.
7. Womyuru Sholun.
8. Shayngun Sholun.
9. Munalinda Sholun.
10. Mavanedi Canda Sholun.
11. Vacula Sholun.
12. Alaperinda Sholun.
13. Tiraveratu Sholun.
14. Arleunu Cadama Canday Sholun.
15. Jeyum Canda Sholun.
16. Kirimi Canda Sholun.
17. Toudaman Sholun.
18. Buddum Cuttum Sholun.
19. Shomuman Sholun.
20. Ghingui Conda Sholun.
21. Sundra Pandia Sholun.
22. Pottapu Sholun.
23. Shingu Wullanda Sholun.
24. Deva Sholun.
25. Shaynahutti Sholun.
26. Vira Sholun.
27. Shayngaru Sholun.

"Total of the Sholun Rajas 27, who reigned 534 years."

5. From the Chola Mahatmya. Wilson's M'Kenzie Collection, vol. i., p. 181. Prinsep's Tables, xliii., p. 121[1].

		Reigned.
1.	Kulotunga	90
2.	Deva Chola	60
3.	Sasisekhara	70
4.	Siva linga	87

---

[1] The years of their reigns are added from a MSS. translation of the original document. Wilson's M'Kenzie Catalogue, vol. ii., p. cxxviii. No. 14.

	Reigned.		Reigned.
5. Víra	87	11. Vijaya	60
6. Kerikála	90	12. Kanaka	70
7. Bhíma	70	13. Sundara	60
8. Rájarájendra	78	14. Kalakala	70
9. Viramártanda	66	15. Kalyána	54
10. Kírttivarddhana	77	16. Bhadra	70

6. The "Chola desa Púrvika Cheritra," Wilson's Catalogue, vol. i., p. 187, says there were forty-four princes, but does not give them. It makes Kulottunga the last of the forty-four, and a contemporary of Kamban. The list of sixteen is noticed, and a Pattira Chola is given as the last prince of that line.

7. Chola Kings mentioned in the "Supplementary MSS." Taylor's Historical MSS., vol. i., p. 197.

Parakirama Soren, reigned thirty years.
Kulottunga, his son, forty years.
Panjala, his son, thirty-five years.
Loga retshaga, his son, thirty years.

The first obtained Chola by conquest from Pandya, the last lost it again.

8. Princes mentioned in the "Madura Sthala puranam." Taylor's Historical MSS., vol. i., p. 73, 80, 96; ii. p. 69.

Kerikala, contemporary with Rajasekhara Pándyan.
Kadu Vettiya, contemporary with Kulopushana and Rajendra Pándyan.
Vikrama, contemporary with Vamsa Sekhara Pándyan.

9. Taylor's Analysis of the M'Kenzie Collection, p. 130. From "An Account of the Chola Rajas."

Vayal Varzi Aditta Cholan.
Suba Cholan.
Varaguna Cholan.
Pugerh Cholan.
Kribala Cholan.
Vithi Vidangam, entitled Bhúpála Cholan, or Cari Canda Cholan.

10. From the "Appendix to Taylor's Analysis," p. 135.

Uttunga Cholan.
Kulottunga Cholan.
Tirumudi Cholan.
Aruntapa Cholan.
Rajendra Cholan.
Manunithi Cholan.
Ala peranta Cholan.
Vara-guna Cholan.
Ala peranta Cholan.
Ariloru kadamai kondai Cholan.
Anantana Cholan.
Cadu-vetti Cholan.

11. Another list of twenty-three kings is mentioned in Taylor's Analysis, p. 135, but not given; the last of the race is said to have been Cari Cala Cholan.

12. List of Chola Rajas, from "The Rajas of the Four Ages." Wilson's M'Kenzie Catalogue, vol. ii., p. cxxix., No. 28.

		Reigned.			Reigned.
1.	Rajendra	71	10.	Swarna Chola	20
2.	Madava Miduna	31	11.	Vootoonga	21
3.	Pandava Chol	60	12.	Teeranoota	21
4.	Vira Chol	51	13.	Tarenda	41
5.	Deva Chola	29	14.	Teeroomaragunda	19
6.	Chenneea	40	15.	Marconda	45
7.	Voow Pandia	30	16.	Vorayoor	20
8.	Culottunga	41	17.	Caricall	41
9.	Tondaman Chakravarti	60	18.	Raja Cholan	53

Art. II.—*On the Rock-Cut Temples of India, by* James Fergusson, Esq.

Read, December 5, 1843.

There are few objects of antiquarian research that have attracted more attention from the learned in Europe, than the history and purposes of the Cave Temples of India, but if we except the still unexplained antiquities of Mexico, I know none regarding which so little that is satisfactory has been elicited, or about which so many, and such discordant opinions exist: and while the age of every building of Greece and Rome is known with the utmost precision, and the dates of even the Egyptian monuments ascertained with almost as much certainty as those of mediæval cathedrals, still all in India is darkness and uncertainty, and there is scarcely a work on architecture published, or lecture read, which does not commence by a comparison between the styles of India and Egypt, and after pointing out a similarity which seems to be an established point of faith in Europe, though in reality no two styles are more discordant, the author generally proceeds to doubt which is the more ancient of the two, and in most cases ascribes the palm of antiquity to the Indian as the prototype. Yet, in truth, Egypt had ceased to be a Nation before the earliest of the cave temples was excavated, and if we except the copies of earlier structures erected by the Ptolemies and Cæsars, there is nothing on the banks of the Nile which does not belong to a different and far more ancient epoch than anything in India.

Had Mr. James Prinsep lived to continue for a few years longer the researches which he commenced, and continued with such success, he probably would have succeeded in raising the veil which still shrouds in obscurity the antiquities of India; and though he has done much, and perhaps more than any one who preceded him, he was called away before his work was complete, and no one in India has since attempted to follow up the task he had proposed to himself. The spirit and enthusiasm he infused into all around him has died with him, and the subject of Indian antiquities relapsed into the former state of hopeless neglect.

The only attempt I am aware of to do any thing to follow up Mr. Prinsep's discoveries is that of Dr. Bird, of Bombay, who, while the spirit was strong in India, commenced the task of copying all the inscriptions in the cave temples on his side of India, and getting drawings made by some Portuguese assistants he had, of their architecture. When I was in Bombay in 1839, his work was in the press, and believing that it would soon be published, and that his testimony on the subject would be more valuable than mine, and probably sufficient to satisfy curiosity, I abandoned the idea of publishing my views on the subject; but when I revisited Bombay in the spring of the present year I found the work still in the press, and with apparently about the same chance of its being published now, as there was four years ago. I have been therefore induced to put the following remarks on paper, believing the subject to be one that could scarcely fail to be of interest to the Society. And I do this not with any idea of anticipating or forestalling Dr. Bird's work to which I would willingly give precedence if I saw any chance of its being published; but, because, as I believe our modes of research to have been totally different, the one may throw light on the other, and if I am not mistaken in what he told me of his work, they cannot interfere. *His* conclusions are drawn principally from the inscriptions and written authorities, while mine have been arrived at almost entirely from a critical survey of the whole series, and a careful comparison of one cave with another, and with the different structural buildings in their neighbourhood, the dates of which are, at least approximatively known. A combination of both these methods of research is necessary to settle any point definitely; but the inscriptions will not certainly by themselves answer that purpose, for in many instances they were cut long subsequent to the ascertained date of the cave, as in the Ganesa Gumpha[1], at Cuttack; and I have also reason to suspect, that, in some instances at least, the Buddhists affected an older character as more sacred, as we sometimes use old English letters in modern inscriptions. Unless, therefore, they contain names that can be identified in some of the lists we possess, or dates, the inferences they lead to, cannot in all cases be relied upon; and except the Behar caves I am not aware of any, where the names have been at all satisfactorily identified; and I do not know of any single cave inscription bearing a date from an ascertained era. Still the inscriptions form a most essential part of the inquiry, but one that I had neither leisure nor learning sufficient to devote myself to; and though I must consequently admit the imperfection of my labours from this cause, I had other advantages for prosecuting the inquiry that have fallen to the lot of few; for in the various journeys I undertook I was enabled to visit almost all the rock-cut Temples of India, from those of Cuttack and Mahavellipore[1] on the east coast, to those of Ellora and Salsette on the western side; and there are few buildings or cities of importance in India which I have not at one time or other been able to visit and examine. I had besides the advantage, that as all my journies were undertaken for the sole purpose of antiquarian research, I was enabled to devote my whole and undivided attention to the subject, and all my notes and sketches were made with only one object in view, that of ascertaining the age and object of these hitherto mysterious structures. Whereas, most of those who have hitherto written on the subject, though drawing and writing better than I can pretend to do, have only visited the caves and temples incidentally while travelling on other avocations; and none that I know of, have been able to embrace so extensive a field of research as I have.

---

[1] Gumpha, is the local designation for a cave at Cuttack; gurbha or garbha, would I believe be more correct.

I hope, therefore, it will be understood, that the following remarks are not offered as the result of much learning or deep research, but simply as the practical experience of an architect in a favorite branch of his study.

In a short paper as the present is intended to be, it will be impossible to enter into all the arguments that may be urged for and against the various disputed points of Indian and Buddhist chronology; and though I am aware that I may often appear dogmatical in stating my conclusions, without adducing the reasoning from which they have been arrived at, I do not think I can be too concise, at least, in the first instance, and if any point appears to be of sufficient interest to the Society, I can afterwards add more detail than my limits at present admit of. I shall at the same time try to avoid, as much as possible, all hypothetical matter, and state merely what bears directly on the subject under consideration, and that as succinctly as possible; and I shall be less tempted to digress, as I have for some time past intended publishing a series of views, illustrative of this subject, accompanied by a volume of letter-press, in which I shall have abundant opportunity of stating all these views at length. That I may, however, be understood in the following remarks, I will state here the principal conclusions I have arrived at regarding the religion of India, without entering on the grounds on which they were formed, or the reasoning by which they are supported.

---

[1] There are various ways of spelling and pronouncing the name of this place. The most popular, and the one by which it is generally known in Europe, is Mahabalipooram, "The city of the great Bali;" but which is now generally allowed to be incorrect, though adopted with a slight variation of spelling by Messrs. Chamber and Goldingham. Mr. Babington calls it Mahamalaipur, "The city of the great mountain," having found it so called in a Tamul inscription there.

Locally, it is called Mahavellipore, Maveliveram, Mailurum, &c. I have throughout this paper adopted the first, as most resembling its popular name, without pretending to any etymological correctness, or to any hypothesis regarding its origin or history.

The first is, That prior to the advent of the present Buddha, a Brahmanical religion existed in the country, a deistical fire-worship, very unlike the present religion bearing that name. That contemporary with this a Buddhistical religion also existed, differing but little from the other, probably two forms of the same religion. The former has entirely perished, and Buddhism, as we now know it, owes its origin to Gotama Buddha, the son of Suddódana; and was either an entirely new form given to the pre-existing religions, or what is more probable, a reform of both, meant probably to amalgamate the two. It could not however have differed much from the Brahmanism of those days, as we find the kings and people changing backwards and forwards, from one to the other, without difficulty or excitement; and in the description of the Greeks and in native records, we often find it difficult to distinguish between the one and the other.

2nd. It appears also certain that the correct date for Sakya Buddha obtaining Nirvana was 543 B.C. The principal authority opposed to this date are the trans-Himalayan chronologies, which generally concur in placing him about five hundred years earlier. They, however, contain their own refutation, (though I have never observed it pointed out,) inasmuch as they all place the event in the reign of Ajatasatta, and place Asoka little more than one hundred years after. Whereas, the date of the latter is perfectly ascertained to be about 250 B.C.; and of the former, not many years from when the Ceylonese authorities place it.

3rd. That from the time of Asoka till the destruction of the Andhra dynasty of Magadha in the beginning of the fifth century, Buddhism was the principal religion in the north of India, though in the south it never seems to have obtained a permanent footing, where the Brahmanical religion still prevailed, and during the time of Buddhist supremacy in the north, that form of it was elaborated which flowing back on the parent country exists in the form we now find it.

With regard to the antiquity of the monuments, all that is here necessary to state is, that the oldest relics of whose existence I am aware are the Laths, bearing the inscriptions of Asoka, dating from the middle of the third century B.C. I am not aware of the existence of any cave anterior to, or even coeval with these, nor of any structural building whose date can reach so high as the first centuries of our era.

I may also state that it appears quite evident that the Buddhists were the earliest cave diggers, and that it is not difficult to trace the connection of the whole series from "the earliest abode of Bauddha ascetics" at Nagarjuni, to the Kylas at Ellora; but as the principal object of the present paper is to point out this connection, I will not enlarge upon it more in this place; but in order to be understood, I must, before proceeding to describe particular caves, say a few words on the subject generally, to point out the different classes into which they are divided, and consequently, explain the names I shall apply to them throughout.

As far as my knowledge of the cave temples of India extends, the whole may be classified under the following heads.

First, Vihara, or Monastery Caves.

1st, The first subdivision of this class consists of natural caverns or caves slightly improved by art; they are as might be assumed the most ancient, and are only found appropriated to religious purposes in the older series of Behar and Cuttack; and though some are found among the western caves, their existence there appears to be quite accidental.

The second subdivision consists of a verandah, opening behind into cells for the abode of the priests, but without sanctuaries or images of any sort. The simplest form of this class consists of merely one square cell with a porch, several instances of which occur in the Cuttack series; sometimes the cell is nearly thirty feet long, as in the Ganesa Gumpha, of which a plan is herewith[1]; and at Ajunta in the oldest Vihara there, the arrangement is further extended by the verandah opening into a square hall, on three sides of which the cells are situated.

In the third subdivision of the Vihara caves, the last arrangement is further extended by the enlargement of the hall, and the consequent necessity of its centre being supported by pillars; and in this division besides the cells that surround the hall, there is always a deep recess facing the entrance, in which is generally placed a statue of Buddha with his usual attendants, thus fitting the cave to become not only an abode for the priests, but also a place of worship[2]. At Baug, the statue of Buddha is replaced by the Daghopa; but this is I believe a solitary instance of its existence in a Vihara cave.

To this division belongs by far the greatest number of Buddhist excavations. The most splendid of them are those at Ajunta; though the Dherwarra, at Ellora, is also fine; and there are also some good specimens at Salsette, and I believe Junír.

---

[1] Plate No. 1.

[2] Plate No. 2.

The Second class consists of Buddhist Chaitya Caves[1].

These are the temples, or if I may use the expression, the churches of the series, and one or more of them is attached to every set of caves in the west of India, though none exist in the eastern side.

Unlike the Viharas, the plan and arrangement of all these caves is exactly the same; and though the details and sculpture vary with the age in which they were executed, some strong religious feeling seems to have attached the Buddhists to one particular form for their places of worship.

In the Viharas, we can trace the progress from the simple cavern to the perfect monastery, but these seem at once to have sprung to perfection, and the Karli cave, which is the most perfect, is, I believe, also the oldest in India. Had the style been gradually elaborated in the rock, from the imperishable nature of such monuments we could not fail to have discovered the earlier attempts; but besides this, there are many reasons that I shall notice in the proper place, which lead me to suppose that they are copies of the interior of structural buildings; and it is not one of the least singular circumstances attached to their history, that no trace of such buildings exists in India, nor, I believe, in Ceylon, nor in the Buddhist countries beyond the Ganges.

All these caves consist of an external porch, or music gallery, an internal gallery over the entrance, a centre aisle which I will call the nave, (from its resemblance to what bears that name in our churches,) which is always at least twice the length of its breadth, and is roofed by a plain waggon vault; to this is added, a semi-dome terminating the nave, under the centre of which always stands a Daghopa or Chaitya.

A narrow aisle always surrounds the whole interior, separated from the nave by a range of massive columns. The aisle is generally flat-roofed, though sometimes in the earlier examples it is covered by a semi-vault.

In the oldest temples the Daghopa consists of a plain circular drum, surmounted by a hemispherical dome crowned by a Tee, which supported the umbrella of state. In the earlier examples this was in wood, and as a general rule it may be asserted, that in these all the parts that would be constructed in wood in a structural building, are in wood in the caves; but in the more modern caves all those parts, such as the music gallery outside, the ribs of the roof, the ornaments of the Daghopa, the umbrella of state, &c., are repeated in the rock, though the same forms are preserved. In front of the more modern

---

[1] Plate No. 3.

Daghopas there is always a sculptural niche containing a figure of Buddha with his attendants; this may have existed in wood in the more ancient, and consequently have disappeared, but I am rather inclined to think it is a modern innovation.

These two classes comprehend all the Buddhist caves in India.

The Third class consists of Brahmanical *caves*, properly so called[1].

In form many of them are copies of, and all a good deal resemble the Buddhist Vihara, so much so as at first sight to lead to the supposition that they are appropriations of Buddhist caves to Brahmanical purposes. On a more intimate acquaintance however with them, many points of distinction are observed. The arrangement of the pillars, and the position of the sanctuary, is in no instance the same as in a Vihara; they are never surrounded by cells, as all Viharas are, and their walls are invariably covered, or meant to be, with sculpture; while the Viharas are almost as invariably decorated by painting, except the sanctuary. The subjects of the sculpture of course always set the question at rest.

The finest specimens of this class are at Ellora and Elephanta, though some good ones exist also on the Island of Salsette, and at Mahavellipore.

The Fourth class consists of rock-cut Models of structural Brahmanical temples, or, as I will call them, "Pseudo-structural temples." To this class belong the far-famed Kylas at Ellora, the Sivite temple at Doomnar, and the Ruths at Mahavellipore. Except the last, which are cut out of isolated blocks of granite, these temples possess the irremediable defects of standing in pits, which prevents them being properly seen, and the side of which being of course higher than the temples, crushes them and gives them an insignificant appearance; and though they are not the least interesting, they are in worse taste and worse grammar than any of the preceding ones.

The Indra Subha group at Ellora should perhaps form a Fifth class, as it cannot in strictness be brought under any of the above heads; but it is difficult to decide whether they are Brahmanical or Jaina; if the former, they belong to the third class, if the latter, they must be classed with what in reality form the

Fifth class, or true Jaina caves, which, without this splendid auxiliary are few and insignificant, though there are some tolerable ones at Khandagiri in Cuttack, and in the southern parts of India; and in the rock of the fort at Gualior, there are a number of colossal figures of one or the other of the Thirthankars cut in the rock, with sometimes, though not always, a small screen left before them, which thus forms a small chamber. Some of them are sitting, some standing, and many of colossal dimensions, from thirty to forty feet high; the whole however is of rude bad sculpture, and the date about, or rather subsequent to the eleventh or twelfth century of the Christian era.

---

[1] Plate No. 4.

Before proceeding to describe particular caves, I may also mention here, that in speaking of Buddhist Chaitya caves, I have used terms borrowed from the names given by antiquarians to the different parts of Christian churches, because in form and arrangement they so exactly resemble the choirs, more particularly of the Norman churches of the eleventh and twelfth centuries, that no confusion can arise from my doing so, and I know not where to look for other terms, that would apply to them, and be intelligible.

In speaking of Hindu temples, as Ram Raz[1] is the only person who has attempted to describe and define the different parts of Hindu architecture, I have used his name, Vimana, to describe the principal tower, or pyramid, or spire, that surmounts the Garbhagriha, or sanctuary, in which the idol or object of worship is placed. In Hindustan, it is usually called Dowal, or Bara, or Bura Dewal, to distinguish it from the former, which is commonly applied to the whole temple. The pyramidal part is called Sikra or Surra, more commonly the former.

The porch which always stands in front of the Vimana, I have also followed Ram Raz in calling Mantapa, though locally it is called Bogha Mandap, Munduf, Muntapum, &c.

Other names of less frequent occurrence will be explained, if necessary, as they occur.

The first series of caves I will mention are those in Behar, which I have not myself seen, as from the descriptions I had read of them I knew that they possessed no great architectural magnificence, and I was not aware, till too late, that these were perhaps some of the oldest caves in India; and their locality, too, in the very birth-place of Buddhism, gives them an interest which no other series possesses, and which certainly would have led me to visit them, had I been as fully aware of it then, as I have since become; for situated in the immediate neighbourhood of Rajagriha, the capital of India at the time of Buddha's death, and where the first convocation was held, and in the neighbourhood of the capital of Asoka[2], they occupy the locality from which we might expect more of interest than from any series in India. To the artist, however, they are the least so of any, and were it not for the inscriptions on the Milkmaid's and other caves would be almost equally uninteresting to the antiquary. The cause of this I believe exists, to a certain extent, in the unfavourable nature of the rock in which they are cut, being a long low hill, consisting of large blocks of granite without any continuous rock. But more is, I am inclined to think, owing to these being the first attempts at cave architecture, and to the simplicity which is a distinguishing characteristic of all the earlier caves. It is in the northern arm of this hill that are situated two small vaulted caves, the first ten feet wide by fifteen long, and nine feet high, and the other about the same dimensions. In the inside they are partially polished, but without any architectural mouldings on them. It is on these caves that were found the two inscriptions in the Lath character, deciphered by Mr. Prinsep, in the sixth volume of the Journal of the Asiatic Society of Bengal, as follows:—

---

[1] Essay on the Architecture of the Hindús, 4to. London, 1834.

[2] Mahawanso, pp. 22 and 23.

"The Brahman girl's cave (and the Milkmaid cave respectively), excavated by the hands of the most devoted sect of Bauddha ascetics for the purpose of a secluded residence, was appointed their habitation in perpetuity by Dasaratha, the beloved of the gods, immediately on his ascending the throne."

The character in which these inscriptions are written, evidently points to an era not distant from Asoka, and if the prince there mentioned is the Dasaratha, the grandson of that king, which I see no reason to doubt his being, we have at least two caves with an ascertained date, viz., about 200 B.C., and with the purpose for which they excavated explained.

As far as our researches have yet gone these are the most ancient caves in India; and I know of no other caves which from their locality, their form, or their inscriptions, can compete with them in this respect.

The other caves of this series are situated at some little distance from the above in the southern arm of the same hill, and though of greater extent, are generally as devoid of architectural ornament as those above described. It is therefore only to their inscriptions that we can look for materials to ascertain their dates or uses.

They consist of the Nagarjuni and Heft Kaneh, or Satghur group.

They have been described, first by Harington, in the first volume of the Asiatic Researches, and by Hamilton, in his Statistics of Behar.

The first contains the inscription first deciphered by Mr. Wilkins, and published with Mr. Harington's description, and which was revised by Mr. Prinsep in August, 1837.

After an invocation to Devi, it contains an inflated account of the virtues and great qualities of the king Yajna Verma, his son Sardula Verma, and his grandson Ananta Verma, who consecrated to this goddess (Devi) the beautiful village of Davidi, and it appears to have been to record this gift that the inscription was engraved.

The inscription on the Heft Kaneh is in the same character, and refers to the same parties.

The alphabet in which these inscriptions are written is very similar to that of the Gupta inscriptions, on the Allahabad Lath; if anything, more resembling the ancient Lath character; we could not therefore have much difficulty in fixing as their approximating date, the fifth century after Christ, and I do not think there can be much difficulty in identifying the Yajna Verma of the inscription, with the Yajna Sri of the Andhra dynasty of the Puranas, and who it is now generally allowed ascended the throne of Magadha, about the year 408 of our era.

The invocation to Devi and the language of the inscriptions is decidedly much more Brahmanical than Buddhist, and as they do not refer to the caves, we are left in uncertainty as to whether the Vermas really excavated them, and to what religion they were dedicated. It is difficult, however, to believe that any work of the Brahmans could be left without any indication of their polytheism, and the simplicity of the caves is a strong evidence in favour of their Buddhistical origin; and as there appears nothing to make us believe that the inscription is necessarily integral, but may have been added afterwards, it affords, I fear, no sufficient data for coming to any satisfactory conclusion regarding the monument in question.

A little further on is another group, the Karna Chapura, and the Lomas rishi caves. They appear to be adorned with some rude sculpture of a Brahmanical tendency. But none of the inscriptions on them that have been deciphered throw any light on their date, further than that they appear to be more modern than the two last referred to. But the drawings I have seen of their sculpture are much too imperfect and rude, to enable me to judge of their age by comparing them with the temples I have visited.

The next series in antiquity, and one of the most interesting in India, though one of the least known, are the caves of Khandagiri, situated about twenty miles from Cuttack, and five from Bobaneswar. There are here two small but picturesque and well-wooded hills of a coarse-grained sandstone, very rare in that neighbourhood, which seem from a very early period to have been a spot held particularly sacred by the Buddhists; and though no caves exist here that can vie in size or magnificence with those of Western India, there are a greater number of authentically ancient caves here, than in any other series, and the details of their architecture are of a higher class than any other I am acquainted with.

These caves were first described by Stirling, in his valuable Memoir on Cuttack, in the sixteenth volume of the Asiatic Researches, and drawings of some of them were published by Lieut. Kittoe, in the sixth and seventh volumes of the Journal of the Asiatic Society; they still however require and deserve a much more careful examination than either of those gentlemen have been able to bestow on them, though the task is by no means an easy one, for they are still inhabited by Fakeers and Byragis of various classes, who, to increase their accommodation, have built up mud walls between the pillars of the verandahs, rendering the interior extremely dark, while the accumulated smoke of a thousand years' cooking has blackened the whole so as to increase the gloom, and has also encrusted over the sculpture in such a manner as to render its details almost invisible.

There is also considerable difficulty in gaining admission to the inhabited caves, and I found it impossible to effect an entrance into the finest of the whole series, which by the way does not seem to have been discovered by either of the gentlemen above-mentioned, and which I stumbled on by chance while wandering about without any guide. It is now inhabited by the chief of the Fakeers, whom I saw preparing to cook his dinner, and who was extremely insolent when I attempted to parley with him on the subject, so that I was obliged to content myself with an imperfect survey from above.

The caves on the Udyagiri (hill of the rising sun) are entirely Buddhist, and of a very early and pure type; those on the other hill, the Khandagiri, are much later, and principally Jaina.

The earliest of the whole series is the so-called Hathi Gumpha, or elephant cave. It is a large natural cavern, the only one in those hills, and very slightly, if at all improved by art, and consequently was probably the earliest chosen as a residence by some Bauddha ascetic; and it is not improbable that it is to the sanctity acquired by some early saint, who took up his abode in it, that we owe the subsequent excavations in the hill. It is on the face of the rock above this cave that there exists the long inscription in the Lath character, which first attracted the attention of Mr. Stirling and his enthusiastic companion Major Mackenzie, and which Mr. Prinsep subsequently deciphered, (as far as its imperfect state would allow,) and published in the sixth volume of his Journal. Unfortunately, the inscription contains no name that has been identified in any of the lists, and as there is no date, we are left entirely to the character of the letters, and its internal evidence, for an approximative era in which it could have been written.

There does not appear much reason to doubt the correctness of the etymological grounds on which Mr. Prinsep assumed the date to be somewhat subsequent to the Asoka inscriptions in the same neighbourhood. At least, I do not know of one reason that can be urged for assigning it a higher antiquity. But as it would take up too much space here to enter into all the arguments that might be urged on this head, I shall content myself with stating, that I think the balance o evidence inclines to a date about two hundred years before Christ, and that cannot be very far from the truth.

The other caves on this hill have all inscriptions in the Lath character, and therefore may all be safely assigned to a date anterior to the Christian era, and probably between that and the date above given. The only apparent exception is that on the Ganes Gumpha, which is in the Kutila character of the tenth century of our era; but the cave in which it is engraved is so entirely of the same character as the rest, both in architecture and sculpture, that it cannot be assigned to a different era, and the inscription must be considered as marking its conversion to the Brahmanical faith. All the larger ones consist of a pillared verandah, of from six to ten feet in width, the length varying with the number of cells which open into it from behind, these being generally about six feet wide. In the Thakoor cave, (the large one above alluded to, to which I could not obtain admittance,) the colonnade is the longest here, being fifty-five feet in length, with wings extending at right angles to it in front.

In the Ganes Gumpha, which is perhaps the most beautiful of the series, the verandah is thirty feet long by six feet wide, and seven in height; there are four doors which open from it into the inner excavation, which is seven feet six inches deep, and of the same length as the verandah. In this instance it is not divided into separate cells[1].

The sculpture on this cave is superior to anything I have seen in India, and I wish much it could be cleaned and casts taken of it. It consists of a frieze at the back of the verandah, broken into two compartments by the heads of the doors. A representation of it is published in the seventh volume of the Journal of the Asiatic Society, p. 683, but Mr. Kittoe's sketch was a very hurried one, and the lithography is not the most perfect, so that it does not do the subject justice.

The only sculpture I am aware of that resembles it in India, is that of the Sanchi Tope, near Bhilsa, and it resembles European art more than any other. There are no gods, no figures of different sizes, nor any extravagance; everything is in keeping and in good taste.

---

[1] Plate No. 1.

Some have only two intercolumniations in front, and by far the greater number only one, or to speak more correctly, consist of an outer cave communicating with the inner by a small door, and in one instance, the rock containing a small cave has been sculptured into the form of a tiger's head, whose gaping mouth forms the vestibule to the cell; I do not know of any other instance of a similar vagary.

On the Khandagiri the caves are much less interesting, being all of an evidently later date. One called Lelat Indra Kesari ka Noor, probably was excavated by that prince, and its date therefore will be the beginning of the seventh century; it is an excavation of no great extent, and it is not easy to make out from the very unfinished state in which it has been left, for what purpose it was designed, being extremely unlike all the others of the series.

As Lelat Indra, however, was a devout worshipper of Siva, and built, or at least finished the great temple at Bobaneswar, it was probably intended to be a Brahmanical cave, like those at Ellora or Elephanta; his Rani, however, was a follower of Buddha, and this may have been her work.

Close to it is the largest cave on this hill; like most others, it consists of a verandah with pillars and a long apartment parallel to it, to which has recently been added an outer verandah of masonry plastered and painted. In this cave are sculptured the images of the twenty-four Thirthankars, and their female energies, which are probably coeval with its excavation, and at one end an image of the monkey-god Hanuman, though he probably is of a later date; he was however too well covered with red paint for me to make out from the style of sculpture to what age he belonged.

None of the other caves on this hill are particularly deserving of notice. On the top of it stands a small Jain temple erected during the the supremacy of the Maharatta; a neat building, but, as might be expected from the character of its founders, of no great pretensions.

One of the most singular features in all the Buddhist caves here, is the total absence of all images of Buddha, and indeed of any apparent object of worship; a circumstance which alone would, I conceive, be sufficient to place them in a higher antiquity than any series in Western India; for it is tolerably certain that the adoration of images, and particularly of that of the founder of the religion, was the introduction of a later and more corrupt era, and unknown to the immediate followers of the deified.

Whatever sculpture is used in these caves, and they contain some of a very high class, is purely ornamental, and has no reference either to the worship of Buddha, or to the purposes for which these caves were excavated[1].

Another singularity is the absence of a Chaitya cave, though it is mentioned in the inscription on the Hathi Gumpha, "the King Aira (?) caused to be constructed subterranean chambers, caves containing a Chaitya temple and pillars." In this instance, however, the cave, if one ever existed, may have been destroyed by those who have quarried stone here for the building of the Bobaneswar and other temples in the neighbourhood. But I am more inclined to think that the Chaitya here was a structural building, probably standing on the summit of Khandagiri hill, and that it has consequently been destroyed, like most of its congeners in India, in the struggles between the Buddhists and Brahmans, its materials removed, and probably a portion of them employed in constructing the present fane.

It is more than probable that it was in the Daghopa attached to these caves, that the famous tooth relic was preserved; which, during the troubles consequent on the invasion of the Yavanas, was removed for safety to Ceylon in the beginning of the fourth century, where it, or its representative, still exists.

I may also remark, that though all the roofs of the caves are flat, and flat architraves run in every instance from one pillar to another in the verandahs, still the early Buddhists could not get over their singular predilection for the arch, and have employed it as an ornament whenever it could be introduced; and thus, though all the doors are square-headed, scarcely any exist that have not a semicircular or rather horseshoe ornament above, placed in the manner of a discharging arch in common masonry. I call this singular, for though the form of the arch is almost universal in all Buddhist caves, it does not, that I am aware of, exist in any Brahmanical one, nor in any structural building in Hindustan prior to the Mahomedan invasion, nor then in almost any Hindu building down to the present time, with the exception of some temples built during the reign of Akbar the Great.

There are not, as far as I am aware of, any other caves on the eastern side of India, certainly none of any importance, except those at Mahavellipore, which being the most modern in India, I will describe last, having previously made the circuit of the peninsula; and we must therefore step at once to the western side, where they exist of a size and magnificence totally unknown on the eastern side. I have not been able to visit all the caves myself, but I have examined those of Ajunta, Karli, Salsette, Doomnar, Ellora, Elephanta, and Mahavellipore. The caves of Nasik, Junir, and Baug, I have not been able to visit, but from all I could learn on the spot, the two first mentioned series contain no type not seen at Karli, Ellora, or Salsette; while the latter are so similar to those at Ajunta, that though extremely numerous, and no doubt interesting, I am not aware of their offering any thing of a new or distinctive character.

---

[1] In one cave, the Jodey Gumpha, some figures seem to be worshipping the Bo Tree; see Kittoe's plate above referred to.

In attempting to describe so many caves, it would be desirable, if possible, to adopt some mode of classification by which to connect so many dissimilar objects. The most desirable would certainly be a chronological one, describing each cave according to its date; but their ages are so imperfectly ascertained, that this would at present, I fear, only lead to confusion; and as each series extends through several hundred years, some nearly a thousand, and consequently, they were contemporary one with another, no succession can be made out between the different series. I shall therefore describe those I have visited in the order in which I have named them above, placing Ajunta first, because it is the most perfect and complete series of Buddhist caves in India, without any admixture of Brahmanism, and contains types of all the rest; next Karli, which, though by no means so extensive as the first, is still purely Buddhistical, and contains the finest Chaitya cave in India. The Salsette or Kannari caves are also purely Bauddha, but very inferior in every respect to the two former. Those of Doomnar and Ellora contain a strong admixture of Brahmanism, and those of Elephanta are entirely Brahmanical, though perhaps not later than some of those at Ellora.

And lastly, I will revert to those at Mahavellipore, which are entirely Brahmanical, and excavated after all the other series were finished.

After crossing the valley of the Taptee from the north, you approach a ghát of some five or six hundred feet in height, supporting the table-land of the Dekkan. The upper line of the ghát is flat and regular and the wall, if I may use the expression, tolerably even except in some places where it is broken by ravines, which extend for a considerable way into the table-land above. It is in one of these ravines that the caves of Ajunta are situated. The entrance to the ravine is nearly half a mile in width, but is gradually narrower as you wind up it, till it terminates in a cascade of seven falls, called the sat koond; the

---

[1] See Transactions of Bombay Literary Society, vol. ii., p. 194.

lowest fall may be one hundred feet high, the others together one hundred more.

Immediately below the fall the ravine makes a sudden turn to the right, and it is in the perpendicular cliff forming the outer side of the bend, and facing the koond, that the caves are situated; the whole series extending, as nearly as I can guess, about five hundred yards from north to south-east.

The most ancient are situated about one-third of this distance, or about one hundred and fifty yards from the most northern end, and are the lowest down in the rock, not being above thirty or forty feet above the bed of the torrent, while to the north they rise to about eighty feet, and at the southern extremity they rise to about one hundred or one hundred and fifty feet; the extreme excavations however are at this end unapproachable, in consequence of the ledge of the stratum, which formed the terrace of communication along the whole series, having fallen away, and left the face of the cliff perpendicular for its whole height, which is as nearly as I could estimate about three hundred feet.

Names have been given to some of the caves, but these are neither very appropriate nor well understood, and as the local cicerone who accompanied me the first day gave the same name to different caves at different times, and, I believe, invented others when his memory failed him, I adopted the surer plan of using numbers; and, beginning at the northern end, or that lowest down the stream, called the first cave number one, and so on to twenty-seven, which is the last accessible cave at the south-eastern extremity; and as this plan can lead to no confusion, I shall now follow it.

According to this arrangement, the ninth, tenth, nineteenth, and twenty-sixth, from the north end, are Chaitya or Daghopa vaulted caves, without cells; the rest are all Viharas, or Monasteries, with cells and flat roofs.

The lowest down and the most ancient, are the twelfth and eleventh; the first-named is the plainest cave of the series, being entirely without pillars, and there is no sanctuary or image, nor, apparently, any visible object of worship; indeed, its only ornament consists of seven horseshoe canopies on each side, four of which are over the doors of the cells, the other three merely ornamental; they are very similar to those at Cuttack, and under them is a reeded string course, similar to that used in those caves, and which I have not observed any where else except there and at the great Karli cave; indeed, it resembles the caves in the Udyagiri in almost every respect, except it being square, thirty-six feet seven inches each way, while those at Cuttack are all longer than their depth. The front would have afforded the best means of identification, but unfortunately it is entirely removed by the rock above giving way; I searched earnestly for inscriptions, but could only find one on the inner wall, in a character slightly modified from that on the laths, and, therefore, probably written early in the Christian era; but it does not, from its position, seem to be at all integral, or to form a part of the original design, and therefore would not fix the date even if deciphered.

The next cave to the north, number eleven, is not quite so large, being only thirty-seven feet ten inches, by twenty-eight feet six inches; it is very similar in some respects to the last, but has four pillars in the centre supporting the roof[1].

This is, probably, one of the earliest instances of the introduction of pillars for such a purpose, and though they are clumsily used here, the example is interesting, as it was to the extended use of them, that we owe all the magnificence of the modern Vihara; the window on each side of the door is divided into three lights, by two pillars standing on each cill[2]. The sanctuary is not finished, and, indeed, seems to have been an afterthought; but there are antelopes, lions, and a boy in an attitude of prayer, sculptured on the wall in the very best style of art, and evidently coeval with those of the Ganesa Gumpha at Cuttack; the walls have been stuccoed and painted, but the paintings are so much destroyed as to be scarcely distinguishable; I could discover no inscription on any part of it.

The next two caves to these on the north side, numbers ten and nine, are two Daghopa caves, almost counterparts of one another, except that the first is very much the largest, being ninety-four feet six inches in depth, and forty-one feet three inches wide, while the other measures only forty-five feet by twenty-three feet.

The largest one has, or rather had, twenty-nine pillars surrounding the nave; they are plain octagons, without capital or base, and have been covered with stucco and painted; thirteen of them are fallen, leaving large gaps in some places, and the outer screen is entirely gone. Like all Daghopa caves, it has a ribbed roof. In some caves, the ribbing is in stone, in others, as at Karli, it is in wood. This cave combines both methods, the aisles being of stone, while the nave has been ornamented with wood, which has entirely disappeared, except some of the battens and pins that fastened it to the rock, and the footings for the ribs, which are sunk to some depth in the rock.

The Daghopa is plain and solid, without any ornament, except the square capital or tee on the top, but there can be no doubt that it was once richly ornamented, probably in wood, for which some mortices remain; and that it was crowned, as at Karli, by three umbrellas.

---

[1] Plate No. 5, fig. 1.

[2] Fig. 2.

The whole of this cave has been covered with stucco and painted, and many of the smaller paintings on the pillars, and in the panels of the roof of the aisles, remain, consisting of figures of Buddha and his disciples in various attitudes, rosettes and other ornaments; but owing to the ruined state of the front, the rain apparently has beat in, and destroyed the larger subjects. There are several inscriptions painted on the plaster, and though none remain sufficiently entire to be transcribed, yet sufficient remains to show, that the characters are those that were used subsequent to the Christian era.

On the exterior face, however, of the cave, but very high up, is an inscription of some length in the pure Lath character, which would at once give an antiquity to the excavation of about 100 or 200 B. C., as far as such evidence can be relied on.

The smaller cave had only twenty pillars surrounding the nave, similar to those in the other; eight of them are broken, but at the entrance there are four pillars of a different form and richer detail. Of its paintings but little remains, except in the inner wall, where they are still tolerably entire. In this circle I found two inscriptions painted on the stucco on the walls; the first under a figure seated on a chair, with the fore finger of the left hand touching that of his right, the second under a Daghopa, painted also on the wall. And on the south side of the cave, opposite the first, there was a third inscribed in a panel under another figure, seated in a chair, but so defaced, that I could only see that it was in the same character as the other two; its existence, however, appeared to me very valuable, from its position as an integral portion of the design which it forms a part of, and if its age can be determined, it will show the period at which the paintings were executed. I have not myself much difficulty in assigning it, on the faith of Mr. Prinsep's alphabets, to the second or third century of our era.

The eighth cave from the end is merely a natural cavern, without any inscription or object of interest; and the seven that precede it, are so modern, that I would prefer going back to number thirteen, and continue to describe them as they occur from this point towards the southern extremity, as I shall thus preserve something like the succession of dates in which they were excavated, without the confusion that would arise from selecting here and there.

Thirteen is only a small cave with two cells, and has nothing remarkable about it.

Fourteen is a large unfinished cave under thirteen, and apparently meant as an under story to it; only the first line of the pillars in the interior is hewn out, and left in a rough state. The verandah pillars, however, are finished, and are of an unusual form, from being merely square piers with plain bands.

Fifteen is a plain square cave, but filled up with mud and debris nearly to the roof, so that there is considerable difficulty in effecting an entrance, and only its general plan can be made out.

Numbers sixteen and seventeen are the two finest Viharas of the series, and apparently belong to, and were excavated at the same time, with nineteen, which is the best finished Chaitya cave of the series; to these may be added the one beyond number twenty, as they all seem of the same age, and the four together form the most interesting group of the Ajunta caves. There are two long inscriptions on the external faces of sixteen and seventeen, which probably contain something of their dates and history[1]; I did not, however, attempt to copy either, and my opinion of their age, therefore, rests entirely on their architectural details and their position in the series; I believe them to have been excavated between the fourth and sixth century after Christ, but more probably about the latter date.

Sixteen is a square cave, sixty-seven feet six inches wide, and sixty-five feet two inches deep, exclusive of the sanctuary; the centre hall is surrounded by twenty pillars, generally of an octagon form, the sides of which are adorned in painting with something like a Roman scroll, alternating with wreaths of flowers[2].

All the details of its architecture are particularly good and elegant, more so than any other cave in this series; there are no side chapels, but eighteen cells surrounding the great hall. The figure in the sanctuary is seated with his feet down; some of the paintings are tolerably entire and extremely interesting, though not so much so as those in the next cave; the swords in the soldiers' hands are shaped something like the Nepalese Kookry, and the shields are of an oblong form.

Seventeen, generally called the Zodiac cave, very much resembles the last described in almost every respect. Its dimensions are sixty-four feet by sixty-three feet, and it has twenty pillars disposed as in the other; it is not, however, so lofty, and the details of the pillars are by no means so graceful or elegant as in number sixteen. The paintings, however, are much more entire, and though the colours in some places are a good deal faded, the subjects can generally be made out.

On the right hand wall, as you enter, a procession is painted.

---

[1] Journal of the Asiatic Society of Bengal, Vol. v. Plate 29.

[2] Plate No. 6.

Three elephants issuing from a portal, one black, one red or rather brown, and the third a white one, which seems the principal one of the group; showing how early arose the predilection for these animals, which still exists among the Burmese and Siamese of the present day. Chattahs and flags are borne before them, and men with spears, swords, and shields make up their retinue.

On the back wall is a hunting scene, in which a maned lion, powerfully and well-drawn, forms the principal object of attraction; there are also deer and dogs, and men on horseback and on foot without number.

In the verandah to this cave are some singularly interesting paintings; at one end a circular one, which I at first took for a zodiac, though, on further examination, I gave up the idea; its centre is divided in eight compartments, and the outer circle into sixteen or seventeen. Each of these compartments are crowded with small figures, but what the subject is I could not make out.

Over the door are eight figures sitting cross-legged; the first four are black, the fifth fairer, the next still more so, the last fair and wearing a crown. It may be remarked, that there are more black people painted in this cave than in any of the others: the women, however, are generally fair, and the men all shades, from black to a European complexion. The roof is painted in various patterns, not at all unlike those still existing in the baths of Titus, though in an inferior style of art. I had not time, even if I had had the ability, to copy these interesting paintings, and I fear any one who now visits them will find that much that I saw has since disappeared.

The style of these paintings cannot of course bear comparison with European painting of the present day; but they are certainly superior to the style of Europe during the age in which they were executed: the perspective, grouping, and details are better, and the story better told than in any paintings I know of, anterior to Orgagna and Fiesole. The style, however, is not European, but more resembles Chinese art, particularly in the flatness and want of shadow; I never, however, even in China, saw anything approaching its perfection.

I looked very attentively at these paintings, to try and discover if they were fresco paintings, or merely water colours laid on a dry surface; but was unable to decide the point: the colour certainly is in some cases absorbed into the plaster, and I am inclined to think they may have been painted when it was first laid on, and consequently moist; but I do not think it could have been done on the modern plan of painting each day all the plaster laid on that day.

Eighteenth. Merely a porch of two pillars, apparently the commencement of an excavation, or of a passage or entrance to

The Chaitya cave, number nineteen[1], which is more remarkable for the beauty and completeness of its details than for its size, being only forty-six feet four inches, by twenty-three feet seven inches in width. Seventeen pillars surround the nave, all of which are very richly ornamented, and above them is a band occupying exactly the same position as a triforium would in a Christian church, and occupied here with niches containing alternately figures of Buddha sitting cross-legged, and standing. The roof is ribbed in stone, but the most interesting feature is the Daghopa, which has here the three umbrellas in stone rising till they touch the roof; in front of the Daghopa is a figure of Buddha, standing. The exterior of this cave is as rich as the interior, and though damaged in some parts, by the rocks falling from above, the injury is less than in most others, and very little labour would free the lower part from the accumulated materials, and display entire one of the most perfect specimens of Buddhist art in India; but one that I must not dwell on longer, as I feel that, without drawings, I should be unable to convey to others any correct impression of its beauties or details.

Twenty. The last of this group is a small Vihara of singular plan, twenty-eight feet two inches wide, by twenty-five feet six inches deep, with two cells on each side. There is no internal colonnade, but the roof is supported by advancing the sanctuary about seven feet into the hall, and making its front consist of two columns in antis. There is also a verandah in front, with an apartment at each end. Its paintings are almost entirely obliterated, except those on the roof, and these consist of frets and flowers, not otherwise interesting than merely as showing its connexion with the Viharas sixteen and seventeen. There is an inscription on one of the pillars of the verandah, but very much obliterated, and apparently not integral.

Before proceeding further in this direction we must return back to the seventh and sixth from the north, and which, though scarcely coeval with the last group described, are certainly later than those first mentioned, and as certainly earlier than the group which succeeds, and which closes our list; but whether they are antecedent to numbers sixteen and twenty, or slightly posterior to them, I am unable to decide.

Number seven is merely a large verandah, sixty-three feet four inches in length, by thirteen feet seven inches in breadth, with the cells opening at the back of it, something in the manner of the Cuttack caves; the front line of the verandah is broken by the projection of two porches of two pillars each, which are here particularly interesting, as they are extremely similar to the pillars at Elephanta, and those in the Doomar Lena at Ellora, and therefore probably not far distant in date. There is also a chapel with two pillars at each end.

---

[1] Plate No. 3.

To the left of the sanctuary are five crosslegged figures, each seated on a lotus, and a lotus between each; on the right, two cross-legged and seven standing figures, the centre lotus of each series supported by figures with snake canopies. Within the sanctuary, on each side, are two large and one smaller figures, and two men sitting cross-legged, and having chowries in their hands. On the step are sixteen figures of disciples seated cross-legged.

Number six is the only two-storied cave at Ajunta. The upper story has twelve pillars, octagons changing into plain squares at top and bottom, and with bold bracket capitals, not painted but sculptured with figures of Buddha. At first I thought this a Jaina cave, and tried to find the twenty-four thirthankars in some place, but was unsuccessful; the series consist of sixteen, eight, four, and are apparently of disciples, as none had the emblems by which the thirthankars are usually recognised.

The cave is fifty-three feet square, the aisles nine feet wide. The lower story is of the same dimensions as the upper, and of the same plan, except that four additional pillars have been introduced in the centre; they are all plain octagons, changing to sixteen sides, with pilasters to each row. Seven of these only are standing, nine having fallen down, owing to the inferiority of the rock in which they are cut, and also to water entering from above, and rotting the stone; the whole cave has a dismal and ruinous look not common here; and it is also without sculpture, having apparently depended entirely on painting for its decoration. The pillars in front of the sanctuary are of the same Elephanta character as those of the last-mentioned cave.

There now only remains to be described the last group of these caves, consisting of the first five from the north, and the last seven at the other extremity; they are all so nearly of the same age, that I am quite unable to discriminate between them, and all evidently the last excavated here. They are singularly unlike any other caves or structural buildings I am acquainted with, and I had consequently less means here than with the others of coming to a satisfactory conclusion regarding their dates; if, however, we assume the last group to have extended to the sixth or seventh century of our era, these must range between that period and the tenth, after which time I conceive no Buddhist caves were excavated in India, and we cannot therefore be far wrong in placing them in the eighth and ninth centuries.

As I cannot fix their succession, I may as well begin with number one, and passing over those already described, proceed to twenty-seven, the last visited.

The first that commences, or rather ends, the series on the north, is a very handsome vihara cave, with a fine verandah ninety-eight feet in length, and a chapel at each end, the hall is sixty-four feet square, adorned with twenty pillars three feet in diameter, richly carved, and with bracket capitals. The cave is a good deal filled up with mud, but, notwithstanding, the paintings are tolerably entire, and some of them very interesting; though both they and the details of the architecture are small and frittered away, when compared with the two first-described groups.

The second is a twelve-pillared cave of which I have given a plan[1]; it is in very good preservation, and the paintings, particularly on the pillars, are tolerably perfect. In the sanctuary there is a statue, of course of Buddha, and a chapel on each side of it, at the end of the aisles. In the one on the north are two most portly, fat figures, a male and female: in the south one, two male figures, occupying a like position. Who they were meant to represent I could not make out, for they were quite strangers to me.

The third is a very fine bold cave, and one of the largest viharas of the series, but does not appear to have been quite finished; the colonnade in the centre consists of twenty-eight pillars, (the only instance I know of such magnificence,) disposed in four ranges of eight pillars each, counting the angular ones in each line; the pillars, generally bold octagons eleven feet in circumference; the whole hall is ninety-one feet square; the aisles twelve feet two inches wide, which is also the width of the verandah. This cave never having been finished does not appear ever to have been painted. It is now so dreadfully infested with bats that it is almost impossible to stay in it any length of time, and I had not the courage to explore its cells; as, however, I found nothing of interest in any of the others, I do not suppose there was much to regret here.

The fourth cave is situated higher up in the face of the rock, and as there is no path to it, I did not discover its existence till the day I was leaving the place, when I saw it from the opposite side of the ravine which I had scrambled up to in a wild-goose chase, to look for the city of Lenapore, having been delighted with its name, and convinced, in spite of the assurance of my guides, that it must contain something of interest; it was, however, "vox et præterea nihil."

The fifth was so choked up with mud, that it was almost impossible to see what it was, further than that it had been a square cave of no great dimensions.

---

[1] Plates No. 2 and 7.

We must now return to cave number twenty, the last described towards the south.

Leaving it you proceed for some distance along the ledge, which, owing to a torrent coming over here during the rains, is more than usually ruined, and the path in some places very narrow and dangerous; and as I had to traverse this several times in the middle of the day at the end of March. I suffered extremely, not only from the heat of the sun, but from the reflection from the rocks, which were heated like an oven.

Having passed this, however, you arrive at the twenty-first cave from the north end, a large vihara, fifty-two feet six inches deep, by fifty-one feet six inches in width. It is similar in almost every respect of plan, style, and execution, to the cave above described as number two. It is, not, however, quite finished, as the pillars of the sanctuary are only hewn rough out of the rock, and many of the details are left incomplete. Its paintings are now nearly obliterated, except on the wall on your left hand as you enter, where there still exists a large figure of Buddha, of a black complexion, or at least very dark, and with red hair, and attended by black slaves. There are several ladies introduced into the composition, but notwithstanding the blackness of their companions, they are here, as in most other caves, represented with complexions almost as fair as Europeans. There is a small chapel with two pillars in antis, on each side, as well as at each end of the lateral aisles. The verandah has fallen down, but the chapels at each end remain, with the pilaster which terminated the colonnade at each end, showing its dimensions and depth.

As I before remarked, the execution of this cave, as well as of number two, is decidedly inferior to that of the intermediate ones; not indeed in richness and quantity of ornament, but in style. There is a weakness in the drawing of the details, and the ornaments are crowded and cut up in a manner that gives a tawdry and unsatisfactory appearance to the whole; very unlike the bold magnificence of those of an earlier age. To use a comparison drawn from the architecture of our own country, they bear the same relation to numbers sixteen, seventeen, and twenty, as the Tudor architecture does to the pure Gothic of the Third Edward.[1]

The twenty-second is a small cave only seventeen feet square, without pillars, excepting two rough-hewn ones in front of the sanctuary, in which is a figure of Buddha seated, with his legs down.

---

[1] Compare Plates No. 6 and 7.

The twenty-third is another vihara of twelve pillars, very similar in all respects to numbers two and twenty-one; it has, however, been left in a very unfinished state, without even an image in the sanctuary, or indeed anywhere else, and there exists no trace of painting that I could detect in any part. Its dimensions are fifty-one feet by fifty-one feet eight inches.

Number twenty-four is the pendant in the series to number three, and would have been one of the finest had it been finished; but merely its general form and dimensions have been made out. Only one pillar has been completely sculptured, and one side of the colonnade exists as a wall with slits in it. It was intended to have been a twenty-pillar cave; the centre hall would have been about forty-three feet square, and the whole about seventy-four feet each way. The details of sculpture and style are of the same class as two, three, and twenty-one, but much more pains appears to have been taken with their execution, and on the whole they are richer than those above alluded to, if it is fair to judge by what is visible; for besides that so little has been executed, the cave is now half filled with mud. The verandah has been completed, but three out of its six columns are broken, and the others much injured.

This cave is particularly interesting as showing the whole process of excavation, from its commencement to the finishing of the details, some parts having been left in every stage of advancement. The rock (amygdaloidal trap) in which they are cut is of a soft, coarse texture, so that the labour of excavation could not have been so great as is generally supposed; indeed, I am very much inclined to believe that this mode of excavating was the cheapest and least laborious by which buildings of this class could be erected. If the stones were quarried so as to be of use for building purposes at the same time, it certainly would be so; but that does not seem to have been the case here, as all the rough work appears to have been done with the pick-axe.

Twenty-five. A small rude vihara cave, with a verandah of ten pillars.

Twenty-six is the fourth vaulted or chaitya cave of this series, and decidedly the most modern. In general plan it is very similar to number nineteen, but its dimensions exceed the former very considerably, the whole width being thirty-six feet three inches, that of the nave seventeen feet seven inches, and the total length sixty-six feet one inch. Its sculptures, too, are far more numerous and more elaborate, indeed, more so than in any other cave of the series; but they are very inferior both in design and in execution, so much so that if other proof were wanting this alone would be sufficient to stamp this at once as one of the latest, if not the last executed cave of Ajunta.

The Buddha on the front of the Daghopa is seated with his feet down.

The walls of the aisles are entirely covered with sculpture, principally figures of Buddhas or disciples, of all sizes, and in every Buddhist position. Among others in the south aisle is one twenty-three feet long, reclining at all his length, being the attitude in which they prepare to receive nirvana (beatitude); above him are an immense host of angels, awaiting apparently his arrival in heaven, and one beating most vigorously a big drum.

The fat figures with judges' wigs, who do duty as brackets, have here four arms, which is the only instance I am aware of in these or any other Buddhist caves, of such a piece of Hinduism.

The details of the pillars, particularly those of the verandahs, are of precisely the same character as all those of this group, but their details are worse executed here, than in any of the others.

There are two inscriptions on the outside of the cave apparently integral, one under a figure of Buddha on your left as you enter, the other is much broken but more distinct, upon your right. The character used in them belongs to the ninth or tenth century of the Christian era.

The twenty-seventh cave is a small square vihara without pillars, and the sanctuary only commenced, and the whole left in a very unfinished state; the front has entirely crumbled away, so that its dimensions can scarcely be ascertained; it was, however, about forty feet in width.

There are one or two caves beyond this, but the ledge having fallen away, they are quite inaccessible. From the ruined state of their fronts, and the debris that has accumulated before them, I was unable to guess either at their size or state of progress; judging, however, from the last caves visited, there cannot be much worth seeing in them, and indeed, I am not quite sure that what I took for caves were not holes, or shadows thrown by masses of rock.

I have been more particular in describing this series than any other, partly because I am not aware that any detailed account of them has been given to the public to which I could refer, and partly because they are in some respects the most interesting series of Buddhist caves in India. They cannot, indeed, boast of a chaitya cave like Karli, but the viharas here are more splendid than anywhere else; they are more entire, and are the only caves that retain much of their original painting and decoration. They also are purely a Buddhist series, and almost every change in cave architecture can be traced in them during a period of about one thousand or twelve hundred years, which is nearly the term during which that religion flourished in its native land; and they thus form a sort of chronometric scale, which I found extremely useful in my attempts to ascertain the ages and dates of caves in other series, none of which are so complete as this one.

The others having all been described before, I shall merely notice such peculiarities as bear specially upon my subject, and refer to printed descriptions for details.

BAUG.

In a small valley or ravine penetrating, like that at Ajunta, into a table-land resting on the ghât on the north side of the valley of the Taptee, and about three miles from the small town of Baug, are situated four caves, which have been described by Lieutenant Dangerfield in the second volume of the Transactions of the Literary Society of Bombay. His description is remarkably clear, and with the drawings that accompany it, enable one to determine at once what they are, and almost the age at which they were excavated.

The largest vihara would at Ajunta be a "twenty-pillar" cave, but owing to the badness of the rock in which it is excavated, the architect left four additional columns in the centre of the hall. In the sanctuary there is a daghopa, an arrangement I do not know of elsewhere, and can only account for here, by supposing that this symbol was necessary for Buddhist worship, and there being no chaitya cave in the series it was necessary to introduce it here; in that case, however, it is strange that they omitted the figure of Buddha in front, which seems to have been the case.

The second cave is an unfinished one, but the third, at some distance from the two first, is a vihara eighty feet by sixty, and though much ruined retains a good deal of its original paintings; judging from them, the only detail given, they appear to be of about the same age as the second group at Ajunta, whilst the large cave belongs to the last of that series, or may be intermediate between the two.

There are two other caves at Baug, but one entirely ruined, the other only commenced.

KARLI.

About half way between Poona and Bombay on the right hand side of the valley as you proceed towards the sea, is situated the great cave of Karli, without exception the largest and finest Chaitya cave in India, and fortunately also the best preserved.

Its interior dimensions are one hundred and two feet three inches for total length, eighty-one feet three inches for length of nave. Its breadth from wall to wall is forty-five feet seven inches, while the width of the nave is twenty-five feet seven inches[1]. The nave is separated from the side aisles by fifteen columns on each side, of good design and workmanship; on the abacus which crowns the capital of each of these are two kneeling elephants, and on each elephant are two seated figures, generally a male and female, with their arms over each other's shoulders; but sometimes two female figures in the same attitude. The sculpture of these is very good, and the effect particularly rich and pleasing. Behind the Chaitya are seven plain octagonal piers without sculpture, making thus thirty-seven pillars altogether; the Chaitya is plain, and very similar to that in the large cave at Ajunta, but here, fortunately, a part of the wooden umbrella which surmounted it remains. The wooden ribs of the roof, too, remain nearly entire; and the framed screen, filling up a portion of the great arch in front, like the centering of the arch of a bridge, (which

---

[1] In the Atlas to Lord Valentia's Travels, a detailed plan of this cave is given, on which the dimensions taken by the scale are forty-six feet wide by one hundred and twenty-six feet long; and as the plan appears to have been drawn with considerable care, (by Mr. Salt, I believe,) and these figures are repeated in the text, I was a good deal staggered by finding so great a discrepancy, and inclined at first to give up my own as incorrect. I have however retained them, not only because they were taken with care, and I cannot see how so great an error could have crept into them; but also, because Lord Valentia's dimensions are quite at variance with those of all the Chaitya caves I am acquainted with, as the following table will show.

	Length.	Width.		
No. 10, at Ajunta, is	94·6	41·3	or as	1 to 2·285
Cave at Karli, is	102·3	45·7	„	1 „ 2·243
Kannari, is	88·6	39·10	„	1 „ 2·222
No. 19, Ajunta, is	46·4	23·7	„	1 „ 1·961
No. 9, Ajunta, is	45·	23·	„	1 „ 1·956
Viswakarma, is	83·1	43·	„	1 „ 1·939
No. 26, Ajunta, is	66·1	36·3	..	1 .. 1·826

While Lord Valentia's dimensions for the Karli cave would be as 1 to 2·739.

It is not however only to confirm my own measurements that I have quoted this table, but to show on how regular a system these caves were excavated, and also as confirming their relative ages, as arrived at in the text from other grounds; for it will be observed, that the oldest caves are longest in proportion to their breadth; and that the ratio diminishes as we descend in the series in an almost perfect progression, the only apparent exception being the Kannari cave; but if that is a copy of the Karli one, as I have stated in the text, this is accounted for. If I am mistaken in placing it as a copy in the ninth century, it must on many grounds take its place as it stands in this table.

Another apparent exception is the small cave, No. 9, Ajunta, which in the text I placed in the same age as the one next it, and I confess I am at present unable to offer any suggestion to account for the discrepancy.

by the way it much resembles,) still retains the place in which it was originally placed.

At some distance in advance of the arched front of this cave is placed a second screen, which exists only here and at the great cave at Salsette; though it might have existed, and I am inclined to believe did, in front of the oldest Chaitya caves, Nos. 9 and 10, at Ajunta; it consists of two plain octagonal columns, with pilasters; over these is a deep plain mass of wall, occupying the place of an entablature, and over this again an attic, if I may use the term, of four dwarf pillars; except the lower piers, the whole of this has been covered with wooden ornaments, and by a careful examination, and measurement of the various mortices and footings, it might still be possible to make out the greater part of the design; it appears, however, as far as I could discover, to have consisted of a broad balcony in front of the plain wall, supported by bold wooden brackets from the two piers, and either roofed, or having a second balcony above it; no part of the wood however exists now, either here, or at Salsette.

It is more than probable, however, that this was the music gallery, or Nagara khana, which we still find existing in front of almost all Jaina temples, down even to the present day; whether the space between this outer and the inner screen was roofed over or not, is extremely difficult to decide; from the mortices at Salsette, I should certainly say it was so; but here the evidence is by no means so distinct, though there is certainly nothing to contradict the supposition.

I could find no traces of painting in this cave, though the inner wall has been plastered and may have been painted; but the cave is inhabited, and the continued smoke of cooking fires have so blackened its walls, that it is impossible to decide the question now; strangely enough its inhabitants are now Sivites, and the cave is considered a temple dedicated to Siva, the Daghopa performing the part of a gigantic Lingam, which it must be confessed it resembles a good deal. While I was there, there was a fair going on, and a festival in honour of his Hindu godship. All the flat spots of the rock were occupied by tents, and the dokaans of the various dealers in sweetmeats and trinkets who frequent these places; and every corner was occupied by pilgrims or devotees of some sort or other, who, though they did not actually prevent my entering or sketching, were extremely clamorous for alms, and annoyed me a good deal by their curiosity and impertinence.

It would be of great importance if the age of this cave could be positively fixed; but though that cannot quite be done, I think it probable that its age is antecedent to the Christian era; and at the same time, it cannot possibly have been excavated more than two hundred years before that era.

On the Silasthamba (pillar) on the left of the entrance, Colonel Sykes copied an inscription, which Mr. Prinsep deciphered in the sixth volume of the Journal of the Asiatic Society; it merely says, "This lion pillar is the gift of Ajimitra Ukas, the son of Saha Ravisabhoti;" the character, Prinsep thinks, that of the first or second century B.C. From its position and import, the inscription appears to be integral, and the column is certainly a part of the original design. For myself, I confess, that if the Lath character was ever in use on this side of India, I do not think it could have undergone so great a change as these characters show in so short a time, and that we must come down, at least, to the Christian era for this inscription.

In a letter lately received from Dr. Bird, of Bombay, he says, "I may mention that the one at Carlee presents an inscription of the twentieth year of Dutthama Hara, otherwise called Duttagamini, king of Ceylon, B.C. 163." I did not see this inscription; I do not know, therefore, whether it is integral or not, nor in what character it is written, which is of importance; for unless other circumstances confirm the identity, I should be afraid of being deceived by the nominal similarity of a king at so great a distance. If, however, the inscription, which Dr. B. will no doubt publish, should confirm this, it will be one of the most interesting dates that these inscriptions have yet disclosed to us.

In disposition and size, and also in detail, as far as similarity can be traced between a cave entirely covered with stucco and painted, and one which either never had, or has lost both these ornaments, this cave is so similar to the two at Ajunta which I had before placed about this age, and on the front of it there is also the reeded ornament which is so common at Khandagiri, and only exists there and in the oldest caves at Ajunta, that from all these circumstances I am inclined to think the above date 163 B.C., as at least extremely probable, though by no means as a date to be implicitly relied upon.

It is to this cave, more especially, that the remark applies that I made, p. 35, that the Chaitya caves seem at once to have sprung to perfection; for whether we adopt the Mahawanso for our guide, or Asoka's inscriptions, it is evident, that this country, under the name of Maharatthan in the former, and Pitenika in the other, is one of the unconverted countries to which missionaries were sent in the tenth year of Asoka's reign; and if, therefore, we assume the above date to be at all near the truth, a century had scarcely elapsed between the conversion of the country and the execution of this splendid monument. There is nothing in the Viharas here or elsewhere which I have placed about the same date, that might not have been elaborated from a natural cavern in that period, but there is a complication of design in this that quite forbids the supposition; and it must either be brought down to a much more modern epoch, or it must be admitted to be a copy of a structural building; and even then but half the difficulty is got over. Was that structural building a temple of the Brahmans or Buddhists? was it designed or invented since the death of Sakya Sinha? or did it belong to a former religion? and lastly, if we are correct in supposing cave digging to have commenced only subsequent to Asoka's reign, why, while the Viharas were still so small, and so insignificant, was so great a work undertaken in the rock[1]?

It would be a subject of curious inquiry to know whether the wood-work now existing in this cave is that originally put up or not. Accustomed as I had long been to the rapid destruction of every thing wooden in that country, I was half inclined to be angry when the idea first suggested itself to me, but a calmer survey of the matter has convinced me that it is; certain it is, that it is the original design, for we find it repeated in stone in all the niches of the front, and there is no appearance of change or alteration in any part of the roof; every part of it is the same as is seen so often repeated in stone in other and more modern caves, and it must therefore have been put up by the Buddhists before they were expelled; and if we allow that it has existed eight hundred or one thousand years, which it certainly has, there is not much greater improbability in its having existed near two thousand years, as I believe to be the case. As far as I could ascertain, the wood is teak. It must be recolleted, that though exposed to the atmosphere, it is protected from being wetted by the rain, it has no stress or strain upon it but from its own weight, as it does not support the roof, though it appears to do so; and the rock seems to have defied the industry of the white ants.

---

[1] In the Mahawanso, (page 12,) it is said that the first convocation was held "in a splendid hall built at the entrance of the Sattapani cave," which would seem to prove that the cave then existed. The Mahawanso, however, was compiled one thousand years after that event, and the cave which may have been a subsequent excavation designed to mark the place where the meeting was held; or at best, it is but a tradition that such was the case.

In like manner it is mentioned in the Chinese work quoted by Colonel Sykes, in his notes on the political state of ancient India, (vol. vi., p. 203, Journal R.A.S.,) that Ananda, "after the death of Buddha, collected five hundred pious men in the cavern of Pi pho lo, and, jointly with them, collected the vinayas." This is evidently the same tradition still further improved upon, and coming from an authority so distant in date and locality, is not entitled to much respect, unless indeed some cave could be discovered of that date; or some circumstantial evidence be adduced to corroborate a tradition which may easily have sprung up from the importance which caves had assumed, as a form of Buddhist architecture, at the time these works were written.

As this is decidedly the finest Chaitya cave in India, a few remarks on the architectural ordinance of these caves may not be misplaced.

However much they vary in size or in detail, their general arrangements, as I mentioned before, are the same in every part of India, and the mode of admitting light, which is always so important a piece of architectural effect, is in all precisely identical.

Bearing in mind that the disposition of parts is exactly the same as those of the choir of a Gothic round, or polygonal apse cathedral, the following description will be easily understood[1]. Across the front there is always a screen with a gallery over it, occupying the place of the rood-loft, on which we now place our organs: in this there are three doors; one, the largest, opening to the nave, and one to each of the side aisles; over this screen the whole front of the cave is open to the air, one vast window the whole breadth of the same section, stilted so as to be more than a semicircle in height, or generally of a horse-shoe form.

The whole light, therefore, fell on the Daghopa, which is placed exactly opposite in the place of the altar, while the colonnade around and behind, is thus less perfectly lit, the pillars there being always placed very closely together, the light was never admitted in sufficient quantities to illuminate the wall behind, so that to a person standing near the door in this direction, there appeared nothing but "illimitable gloom."

I do not conceive that a votary was ever admitted beyond the colonnade under the front, the rest being devoted to the priests and the ceremonies, as is now the case in China, and in Catholic churches, and he therefore never could see whence the light came, and stood in comparative shade himself, so as to heighten its effect considerably. Still further to increase this scenic effect, the architects of these temples have placed the screens and music galleries in front, in such a manner, as to hide the great window from any person approaching the temple; though these appear to have been omitted in later examples, as in the Viswakarma of Ellora, and the two later Chaitya caves at Ajunta, and only a porch added to the inner screen, the top of which served as the music gallery; but the great window is then exposed to view, which I cannot help thinking is a great defect. To a votary once having entered the porch, the effect is the same, and if the space between the inner and outer screen was roofed, which I suppose it to have been, no one not previously acquainted with the design, could perceive how the light was admitted; supposing a votary to have been admitted by the centre door, and to have passed under the screen to the right or left, the whole arrangements were such, that an architectural effect was produced certainly superior to any thing I am acquainted with in ancient or modern temples.

---

[1] Plates No. 3 and No. 8.

Something of the same sort is attempted in the classic and modern Hindu temples, where the only light is admitted by the door directly facing the image, which is thus lit up with considerable splendour, and the rest of the temple is left in a rather subdued light, so as to give it considerable relief. The door, however, makes but a clumsy window compared with that of the Buddhist cave, for the light is too low, the spectator himself impedes a portion of it, and standing in the glare of day, unless he uses his hands to shade his eyes, he can scarcely see what is within. In the Hypœthral temples, this was probably better managed, and the light introduced more in the Buddhist manner; but we know so little of their arrangements, that it is difficult to give an opinion on a subject so little understood.

Almost all writers agree, that the Pantheon at Rome is the best lit temple that antiquity has left us; in one respect it equals our caves, that it has but one window, and that placed high up; but it is inferior, inasmuch as it is seen to every one in the temple, and that the light is not concentrated on any one object, but wanders with the sun all round the building.

I cannot help thinking that the earlier Christian architects would have reinvented this plan of lighting, had they been able to glaze so large a space; but their inability to do this forced them to use smaller windows, and to disperse them all over the building, so as to gain a sufficiency of light for their purposes; and a plan having once become sacred, it never was departed from in all the changes of style and detail which afterwards took place.

Besides the great cave, there are, of course, a number of viharas attached to it; they are, however, all of them, small, and appear very insignificant compared with its splendour. This may perhaps be, and I am inclined to think is, an evidence of their antiquity; for the Viharas seem at first to have been mere cells, "where the Arhans sat to meditate," as Fa-hian expresses it, but to have become magnificent halls and temples as we find them at Ajunta, as the religion became more corrupt.

The principal vihara here is three tiers in height, (they can scarcely be called stories;) they are plain halls with cells, but without any internal colonnades, only the upper one possesses a verandah; the lower ones may, indeed, have been constructed with this usual appendage, but great masses of the rock above have given way, and falling down, have carried with them the whole of the fronts. There are no sanctuaries, and though there are one or two relievos of Buddha sitting in the lotus, and with his legs down, they do not appear to be integral or original parts of the design.

Still further are numerous similar excavations, and some fine cisterns filled with clear spring water; near one of these is a small daghopa much ruined.

There is a small vihara on the south side of the great cave, of the same character as those on the north, but owing to the fair and crowd, my examination of these caves was much more imperfect than I could have wished. There may be some that I did not enter, and peculiarities that I did not observe in those I did. From all I saw, however, I am inclined to rank them with the earlier caves at Ajunta, and though not perhaps quite so ancient as the Udyagiri series, they cannot be much more modern; which goes far to confirm the date I have above given to the great cave.

KANNARI.

These caves being well known, having been often described before, it will not be necessary to be so detailed in my description of them, as of the Ajunta series; though they are more numerous, amounting I should think to nearly a hundred in number, they are, on the whole, much less interesting than either Ajunta, Ellora, or Karli; the great chaitya cave being very similar, though very inferior to that of the last-named series, and presenting no peculiarity not seen in the other, while none of the viharas can compare with those of the first two, either in size or design, the greater part of them consisting merely of a small square cell, with a small verandah of two columns in front.

The whole of these caves are excavated in one large bubble of a hill, situated in the midst of an immense tract of forest country. Most of the hills in the neighbourhood are covered with the jungle, but this one is nearly bare, its summit being formed by one large rounded mass of compact rock, under which a softer stratum has, in many places, been washed out by the rains, forming natural caves, which slightly improved by art, have been appropriated as cells, some probably the first so used on the hill; it is in the stratum again below this, that most of the excavations are situated.

Approaching the caves by the usual route, the first you come to is the unfinished excavation figured and described by Salt, p. 47, Vol. I., Transactions of Literary Society of Bombay. It was intended, apparently, to have been a chaitya cave, though it has been left so incomplete that it is difficult to make out the plan; the outer porch, however, is nearly completed, and it is evident that it was not intended to have an outer music-gallery screen, like that which adorns its more ancient neighbour; and it presents but little of interest in its details, except, perhaps, that its external pillars are of the same order as those at Elephanta, and therefore probably mark it as a cotemporary example. On the whole it puts me much in mind of Lelat Indra Kesar ka noor more than any other cave I have seen, but they are both so unfinished that it is difficult to institute a comparison between them. It is, probably, the latest excavation of any importance attempted in the hill, and may date about the ninth or tenth century of Christ, probably even more modern than that.

Immediately beyond this is a group of caves, (containing among them the great chaitya cave of this series,) which I would willingly omit describing in detail, as that has been so well done by Mr. Salt, in the paper above referred to, but they contain so much that is interesting, and I may add, puzzling in their chronology, that I cannot pass them over; and to ensure greater exactitude, I shall try to combine his description with my own notes.

The first is a vihara consisting of a long irregular verandah of inferior workmanship, with cells opening at the back of it; but the point of greatest interest is, that it also contains two recesses or sanctuaries, in which stand daghopas. The three sides of the recess in which the most southern stands, are divided into panels, in which are carved one, two, or more figures of Buddha and of Bodhisatwas, in various attitudes.

Behind the northern daghopa, is a figure of Buddha seated on a Sinhasana or lion-throne placed on a lotus, the stalk of which is supported by two boys with hoods of cobra de capellos; from the stem of the lotus, two others spring, on which stand two youthful figures with chowries, and one with a lotus-bud in his hand; two flying figures above, and two priestly ones below, complete the tableau, which is found both at Karli and Ajunta, besides being frequently repeated here; but in no cave in any of these series, that could date before the third or fourth century of our era, unless, indeed, it is in such a position that it could have been added at any time. The verandah extends so closely up to the large cave, that only a partition of a few inches thick has been left between them, and which subsequently has been broken through, thus leaving an irregular hole by which you may pass from the one to the other.

The great cave[1] in almost every respect, resembles the great cave at Karli; it possesses the music-gallery screen in the same position and of the same form; and here it is still more evident, that the centre at least must have been roofed, but the roof could not have continued to the end, or it would have cut across the great figures of Buddha, twenty-three feet high, which occupy both ends: below where this roof would come, the wall is covered with sculpture, but in a very crude style of Buddhist art; indeed I do not know of a cave with anything so wretched.

The front of the cave above this roof is here quite plain and evidently not meant to have been seen; at Karli, though it must also have been nearly concealed, it is still ornamented with a series of niches; indeed, no part of that cave, seen or unseen, is slurred over as every thing is here; there is no trace of the wood-work which should have filled the great window, but over the top of the arch is a number of pins remaining; they seem, however, better fitted to hang curtains to, than to support wood-work, and I think must have been applied to the former purpose; but whether by the original diggers or not, it would not be easy to decide.

The dimensions of the interior are somewhat less than those of Karli, the total length being eighty-eight feet six inches, total breadth thirty-nine feet ten inches, the length and breadth of the nave being seventy-four feet two inches and thirty-nine feet ten inches respectively. The daghopa, forty-nine feet in circumference.

Very little of its wood-work remains, none on the daghopa, and on the roof only the tenons and battens to which the rafters were attached, and there are no remains of a screen in the great window.

The pillars that surround the nave are of the same order as those at Karli, but executed in the most slovenly manner,—the elegance of proportion is entirely lost. The figures on the capitals are much worse executed; the elephants here are in some instances employed in pouring water from jars they hold in their trunks, on daghopas, or on the bogaha, or sacred bo tree; and the boys with the snake hoods are also introduced. Only six of the columns, however, on one side, and eleven on the other, are so ornamented, and the rest were never intended to be so, as they are finished as plain octagons; which is another instance of the carelessness exhibited in this cave.

In front of the cave there is a court-yard of irregular form, (see accompanying plan,) the front being only thirty feet wide, and not parallel to the front of the cave, while immediately beyond the Silasthambas it is thirty-six feet, and at the vestibule of the cave itself is forty-six feet including the niches.

---

[1] Plate No. 8.

It is extremely difficult to account for this irregularity, and the smallness of the court, which is quite inexcusable on any architectural grounds, and gives a poor appearance to the whole front. It could not have been caused by the form of the hill, as Mr. Salt supposes, and it was not till after long thought on the subject that what now appears to me to be the true solution of the problem occurred to me, namely, in the prior existence of the long vihara to the south, and of the little daghopa on its circular cave, marked E. in the plan, the whole interior surface of which is divided into panels filled with figures of the Buddha, similar to those described in the vihara on the other side of the great cave.

In describing the caves at Baug I mentioned the daghopas existing in the sanctuaries, apparently because there existed no chaitya have in the series; and believing this explanation to be the correct one, I was not a little surprised to find three daghopas existing here at the very threshold of the great Chaitya cave; and it was not till it occurred to me that they must have existed there before the great cave was begun, that I could account for the circumstance; the form of the court soon convinced me (after the idea was started), that this was the true solution: they are more ancient; and the spot having probably become particularly sacred, some devotee resolved on excavating a great temple between them; here, however, arose the difficulty. North and south, or at right angles to the axis of the hill, these caves are only thirty feet apart, and it was necessary to introduce a cave forty feet wide between them; this could only be done by commencing on the lesser dimension, and working back till he got behind them, where the cave was extended to the required width. It is quite evident that the long verandah of the southern cave never could have been allowed, had it been subsequently excavated, to approach so near the great cave as to endanger the wall breaking between them; for there is nothing to govern its length; it could have been as easily extended in one direction as the other; but the width of a chaitya cave governs all the other dimensions, and if the cave was to be of a certain class, it was necessary in the first place that it should have a certain width; and it was to obtain this it has encroached so nearly on its northern and southern neighbours. This will be more easily understood by referring to the accompanying plan.

Assuming this to be correct, we are at once met by a still greater difficulty than the one got over. When I first entered this cave, seeing its similarity in design and detail to the one at Karli, I at once concluded they were of the same age, and that the difference in execution was to be accounted for from the greater coarseness of the rock, and that it must have been designed by some provincial or inferior artist; and in every other case I know, this reasoning would have held good, for I know no instance in which an architect, Buddhist, Brahmanical, or Mahometan, has copied a building of a former age. Yet this cave seems to be the exception, and if I am not very much mistaken, it must be brought down to the ninth or tenth century of Christ.

It is also not a little singular that the execution of every detail should be so clumsy and bad; for though we find in the descending series of Buddhist structures a tendency to polytheism, and the fripperiness of ornament, I do not know any instance in which the figures and details are so bad as here, and this, too, at a time when Hindu art had scarcely passed its culminating point of perfection.

After proceeding some little distance to the northward from this group, and then turning to your right hand, you enter a narrow glen or gully, down which a strong mountain torrent pours during the rainy season. It is in the rocks that form the two sides of this glen that the greatest number of caves are situated.

The first you approach on your right hand is the so-called Durbar Cave, the finest vihara of the series, and the only one that can compete with the Ajunta ones in size; its dimensions are ninety-six feet six inches in length, forty-two feet three inches in depth, of course exclusive of the cells; the colonnade goes round only three sides, and the sanctuary occupies one intercolumniation of the inner range, as in number twenty at Ajunta. It is, however, too low for its other dimensions, being scarcely nine feet high, the pillars and plan of the same order as the Viswakarma at Ellora. The verandah has a range of eight plain octagon pillars, with pilasters. Below this is another cave, or rather series of cells, which give it the appearance of being two stories high, but there is nothing remarkable in the lower ones.

Immediately opposite there is an immense excavation, but so worn by the rain and torrent, as to look more like a natural cavern; and were it not for some fragments of columns hanging to the roof, and details in some more sheltered places, I should have supposed it to be such.

Proceeding upwards on either hand are some twenty or thirty excavations, but none worthy of particular description; some (two I think), contain daghopas, the rest are small viharas, with one or two cells and verandahs, the pillars of which are generally either entirely washed away, or very much worn, the material being soft laterite or breccia, little better than hard gravelly clay.

The first cave in this direction has some of its pillars the same as those of number seven[1] of Ajunta, and which I have seen nowhere else; it has also the cushion pillars of Elephanta. From its position, and also from the gradual progress of style in these caves, I feel inclined to think this one of the most modern, and all below it consequently more ancient, and therefore probably coeval with the group of the Ajunta series, described as numbers sixteen and twenty.

Above these, on the south side, under the brow of the hill, is another series of viharas. They are small, but some of them, especially three, very interesting, from the walls being entirely covered with sculpture, of very fair execution; the general design of which is a Buddha seated on a lotus, the same as already described as placed behind the northern daghopa in the long cave; this is repeated here with almost no variation, and its style is so similar, that it certainly represents a form of religion and art that must be very nearly, if not quite cotemporary.

The general size of these caves is from twelve to fifteen feet square; one, however, that I paced, was about forty feet square, without pillars. It was covered with sculpture, but strange to say, there was no sanctuary, but merely one large standing figure of Buddha opposite the entrance. There were cells as usual, and benches round the sides.

It is not very easy to decide whether these caves are more modern than those below; on the whole I am inclined to think they are, though their age cannot differ much; and if so, the Kannari series will be arranged as follows: first those in the ravine, in the fourth or fifth century; those last described with those on each side of the great cave, probably at least a century later; then the great cave; and, lastly, the unfinished one first alluded to.

They may thus be considered one of the most modern of the Buddhist series in India. Indeed, I am inclined to think that the greater part of them at least were executed by a colony of Buddhists, who may have taken refuge here after being expelled from the continent, and who have tried to reproduce the lost Karli in their insular retreat.

Some remains of plaster and painting exist in almost all these caves, though from the porous nature of the stone through which the water must percolate during the rains, the vestiges are small, and I could not find one complete figure in any; owing to this cause to the plain; in the present instance the cliff is nowhere higher than twenty feet, which necessarily circumscribes the dimensions of the caves, to keep within it, thus rendering them the most diminutive series I know of in India; and besides, the rock is the most unfavourable that can be conceived for the exhibition of sculpture, the whole hill consisting of a coarse iron-stone or laterite, very similar to that of Cuttack, but here of a coarser grain than I ever before saw it.

---

[1] I am not quite certain this should not be number twenty; the note was made at Salsette, and I fear the drawing was wrongly numbered; for the context it is immaterial which.

At the bottom of the cliff a broad terrace has been formed, which still exists tolerably entire, at the end of which you enter laterally into the so-called "Child's Cave." Here the daghopa stands in the centre of a small court, in the open air; immediately behind it is the cell or sanctuary, in which is a figure of Buddha sitting cross-legged, with a male attendant on each side of him; the cell is isolated by a covered passage running round it, one side of which is occupied by a recumbent figure, about ten feet long, in the same attitude as the larger one in the most modern chaitya cave at Ajunta, described above; behind are three Buddhistical figures, sitting cross-legged, probably Bodhisatwas, or of the predecessors of the great occupant of the sanctuary. A smaller figure stands between each of these, and three more stand on the third side of the passage, probably disciples.

The next in importance is Bheem Sing ka Bazaar. It is a chaitya cave, with vaulted and ribbed roof of the usual form and detail, but here only about thirty feet deep by fifteen wide, and without side aisles. There has been a porch nearly square in front of it, but the roof has tumbled in, and now encumbers the entrance. The rock in which this cave is cut is, as in the former instance, isolated by a passage running round it; round two sides of this passage, and a small portion of the third side, there runs a square colonnaded verandah, from which open a number of small cells, thus forming a combination of a chaitya cave with a vihara, which I never saw before. The pillars were evidently intended to have been carried round the third side, but it has been left unfinished, which does not say much for its antiquity.

The next three in importance are the great and little Kutchery, and the Ranee's Abode[1]. They have all semicircular domed recesses at the inner end, with daghopas. One has a rib-vaulted roof like the bazaar, but the other two have square flat roofs divided into nine compartments, and supported by four pillars.

The other excavations are of no great extent, being merely cells from six to ten or twelve feet square, with the usual verandah in front; but the extreme coarseness of the rock seems to have precluded even the quantity of ornament being bestowed on them, that is usual in other series.

---

[1] These names are taken from Colonel Tod's description of these caves in his Journal.

Counting those only commenced, and even the merest scratchings in the rock, there may be from sixty to seventy caves altogether. I could not count so many, and where therefore Colonel Tod found his hundred and seventy caves I am at a loss to conceive.

It is very difficult to form an opinion as to the age of these caves, as it has been impossible for their architects to express or define their details with any exactitude in such a pudding-stone. I have, however, no doubt that the whole were at one time plastered, and that what is now seen is merely the coring; but here again the badness of the material, by allowing the water to soak through, has peeled off every vestige of the decoration, and the figures seem to have gone through a second attack of the small-pox, which has disfigured them to an extent almost ludicrous.

As far, however, as I could judge, they must all be very modern. The similarity of style and execution in the Child's Cave to number twenty-seven of Ajunta, convinced me that they were of the same age; and in the whole of them there is want of that simplicity and majesty which distinguishes the earlier Buddhist works, and a tendency to Jainism, which exists only in the latest caves; and what architectural details I could make out by looking at them from a distance, all went to confirm this impression.

About fifty paces from the edge of the cliff, in the centre of the plateau, a pit has been dug, I thought of about fifty paces by twenty, and about forty-five feet deep. Tod, however, says a hundred feet by seventy, and thirty-five deep, (and he probably is more correct, as, contrary to my usual custom, I omitted to measure it): towards the west end of this pit a temple has been left standing; the top of the Sikra or spire being level with the plateau above. It differs in every respect from those already described, being in fact merely a model of a Brahmanical structural temple, with all the accompaniments usually found in them. Indeed, externally, the temple very much resembles those at Barolli, described by Tod, and which I had just visited. The vimana is almost a fac-simile, as far as the material would allow, though the mantapa or porch is slightly different in form, and larger in proportion. In the sanctuary is a black marble statue of Vishnu, well executed, and with all his usual attributes, and on the floor in front of him a large well-oiled Lingam, which evidently is now the principal object of worship, indicating a change of masters I have several times seen in these parts.

Around the large temple are nine smaller shrines, each of which had contained a piece of sculpture; but only three are now so occupied. One, a tablet, with six figures very much defaced; another, Vishnu reposing on the Seseja; and the third, a series of the ten avatars, but with this singularity: that here the ninth, instead of being Gotama, as in every other of the series I had then seen, is Chaturbuj himself, with his gadhi, chakra, and all his usual attributes.

In front of the temple, a long level passage, cut through the rock (a hundred and ten paces long,) leads to a valley or depression in the plateau, and was evidently formed, not only to afford a level entrance to the temple, but to allow the rain-water to drain off, which otherwise would have stagnated in the pit.

It is not very easy to understand why this passage was not brought out through the scarp, and thus access given to the temple from the plain. Perhaps it arose from an unwillingness to destroy the caves, which would have been necessary had that been attempted; and the Brahmans, unlike our northern reformers, never seem to have been destroyers. Perhaps, also, it may have arisen from the necessity of placing the temple east and west, and a consequent desire to approach it in front, and not at right angles.

The Brahmans never, it appears, were cave diggers; and when, in the struggles with the Buddhists, they thought it necessary to engage the prejudices of the people on their side, by adopting this most popular and splendid way of erecting places of worship, nothing can be more clumsy, and if I may use the expression, unnatural, than the way in which they set about it. They either copied Buddhist viharas, but without the cells that gave them meaning, and covered the walls with sculpture, which, owing to the badness of the light, they were ill-fitted to display; or, what was worse, they copied in the rock, (as in this instance,) their own structural temples; but thus necessitating their being placed in a pit, which quite destroyed their effect. Had they always been able to find isolated rocks, as they did at Mahavellipore, this remark would lose much of its force; but both the Kylas at Ellora, and this temple, are deprived of half their effect from this cause.

The Buddhist temples, on the contrary, are always in good grammar; they are all interiors,—really caves,—and with only such external ornament, such as verandahs to the viharas, and framings to the great window in the chaitya caves, as were always in good taste, and the purpose and meaning of which was at once seen. There is no instance of a Buddhist copying an exterior, as is here the case, or any building not a cave.

The similarity of this temple to that at Barolli also enables me, at least approximately, to determine its age; for I have made up my mind, for reasons which I cannot enter on here, that the former was erected in the eighth or ninth century after Christ. This probably was coeval. The sculpture, too, though executed in rather a coarser material, (fine hard freestone,) here is very similar in design and execution.

ELLORA.

I have put off speaking of Ellóra to nearly the last, not only because it contains some of the most modern cave temples of India, but because it is the most complicated series I am acquainted with, containing examples of almost every kind, except, perhaps, the most ancient, and therefore demanding more knowledge of the subject to understand it, than any other series; and also, because, as being the best known in Europe and the one generally quoted for its unknown antiquity, I shall have to contend more with preconceived opinions than when speaking of the others. Its having been so often described, however, will enable me to be more concise and say less on the subject than I should otherwise have been obliged to do.

It is usual for travellers to be awe-struck on first approaching "this vast amphitheatre of rock-cut temples." It is, however, the principal defect of this style of building that it makes so little appearance outside. Some of the Vihara caves have fine fronts, but being either as a cliff as at Ajunta, or Karli, they bear much the same proportion to the rock as a window does to a house side, and therefore lose any appearance of size, or they are excavated on the sloping side of a hill as at Ellora, and can only be seen directly in front; the Viharas are never fine externally, and here less so than usual, owing to the sloping nature of the hill; and the Kylas is absolutely invisible from the exterior. Indeed, a man might ride along the whole front, and at a few hundred yards' distance, and, unless previously warned, never be aware that he was in their vicinity.

To convey to the European mind a still greater impression of their magnificence, it has been asserted more than once, that they are cut in hard red granite, whereas, the rock is the usual trap formation of this side of India, a sort of porphyritic greenstone or amygdaloid, I believe; but whatever it is, certainly as soft and as easily worked a material as could well be used for architectural purposes.

The amphitheatre of rocky hill in which they are situated cannot be less than two or three miles measured on the chord; and the caves are scattered over a distance about a mile and a half. Sir Charles

Mallet says, one mile from the Indra Subha to the Viswakarma in a direct line; this great space takes very much away from the effect when viewed as a whole; and it is only when in the courts of the caves, or when studying their details, that you are aware of their greatness or magnificence.

In describing these caves most travellers commence with the most northern group, the Jugganath Subha, and proceed to the most southern, the Viswakarma group; both Sir Charles Mallet and Colonel Sykes follow this plan, and the guides invariably take the traveller to the most northern first, so that if the notes are commenced on the first inspection, they almost certainly take this direction. Seely is almost the only exception I know to this rule, and he plunges at once "in medias res," and describes first the Kylas, and then the others indiscriminately.

The true way, however, to describe this series (which as far as I am aware no one has followed,) is to commence from the southern extremity, where the Buddhist group exists, and, consequently, the most ancient caves of the series, and the gradation is then easily perceived by which they passed into the Brahmanical, which, after rising to its glory in the Kylas and Doomar Lena, again for a short time passed into the half-Jaina group of the Jugganath Subha, and ended there.

I regret much that my notes on these caves are not more full than they are; but having read detailed descriptions by such men as Sir Charles Mallet, Colonel Sykes, Seely, Wales, &c., I thought nothing remained undescribed, and merely noted what bore directly on the subject of my researches; and the volumes that contain these descriptions being much too bulky to be carried about, it was not till too late that I discovered how much, particularly among the Buddhist temples, remains to be known, and described.

The whole series of Ellora consists of about thirty excavations, of which ten are Buddhistical, fourteen Brahmanical, and six belong, properly speaking, to neither of these sects, and they can scarcely be in strictness ascribed to the Jains, though savouring more of their religious tenets than of either Brahmanism or Buddhism.

Of the Buddhist group the principal cave is the so called Viswakarma, the only Chaitya cave of the series; it is neither so large as those at Karli or Salsette, being only forty-three feet wide internally, by eighty-three feet one inch in length, nor is it so rich in its details as the two later Chaityas at Ajunta. Still it has beauties of its own which render it highly interesting; its exterior court-yard (a square of about seventy feet with a handsome colonnade on three sides,) and the simple lines of the front form to my eye a more pleasing exterior than that of any of the others, at least at present, though it is impossible now to judge of what their effect may have been when their galleries and wooden decorations were complete.

It differs from all others in having what we would call a triple or Venetian window in the centre, which externally is certainly more pleasing than the great arch in the others; but that as I have suggested above was probably not seen from without, and internally, this cave is certainly worse lighted than the others; though in such a climate its gloom can scarcely be called a defect.

Internally the design of the temple is marked with considerable elegance and simplicity; the two pillars that support the gallery over the entrance are rich and handsome; the twenty-eight others are simple octagons, changing in one part to sixteen sides, and of great elegance.

The sculpture in the panels of the triforium belt disappointed me, but under the springing of each of the stone ribs of the roof is a corbel figure, alternately male and female, all the males having the snake hood, which the females have not

In front of the daghopa is Buddha sitting with his feet down, with an attendant on each side, and over his head are a number of flying figures, only found in the most modern Buddhist caves, and savouring much more of Brahmanism than the pure worship of Sakya Muni; there is no trace of painting or stucco on the cave, though the side walls of the aisles being left rough, look as if that had been intended by the original excavators.

Though the form and ordinance of this temple are purely and correctly Buddhistical, the sculptures deviate strangely from the usual forms adopted by that sect; standing, for instance, in the court-yard, you do not see any figures of the deified, no cross-legged Buddha, or Bodhisatwa, except in a very subordinate position; and on the contrary, the sculptures generally consist of pairs of figures, male and female, as seen in Brahmanical temples, and in one group in no very decent attitude, the only instance I am aware of anything approaching to indecency in any temple of this sect; internally the same is the case; and it is indeed, too evident, that the pure religion of Buddha had deviated much from its primitive simplicity before this cave was excavated, and that it was already verging fast to that which succeeded it; a circumstance which alone would be sufficient to bring down its date to a very modern time; but the details of its architecture afford more certain means of comparison, and place it somewhere between the two most modern Chaityas at Ajunta; it may be as old as the one, or as modern as the other; but it cannot, I think, under any circumstances, be placed higher than the sixth or seventh century of our era, and I would not bring it down lower than the eighth or ninth.

There are numerous Viharas attached to this great cave, the principal of which is the great Dehrwarra, one of the largest excavations of the class that I know of; being about one hundred and ten feet by seventy, including the side recesses; it is, unfortunately for effect, very low, and its details are by no means to be compared to those of a similar age at Ajunta. It is probably of the same date as the Viswakarma; if any thing, more modern.

Close to the great cave is a small and very pretty Vihara, in which the sanctuary stands free, with a passage all round it, as in some of the Sivite caves further on; and the appearance of the warders on each side of its door would lead one rather to expect an image of Siva inside than the Buddha which actually occupies it. The details, however, of its architecture are the same as in the Viswakarma.

Communicating with this one, is a small square Vihara, the roof of which is supported by four pillars of the same detail as the Dookyaghur, the cave next it on the north; but though surrounded by cells it has no sanctuary or images.

Higher up the hill than these are two others containing numerous cells, and one with a very handsome hall, the outer half of which has unfortunately tumbled in; enough, however, remains to show not only its plan, but all the details, which very much resemble those of the last group of Viharas at Ajunta.

In the sanctuaries of most of these caves are figures of Buddhas sitting with their feet down. On each side of the image in the principal one, are nine figures of Buddhas, or rather Bodhisatwas, seated cross-legged, and below them three and three figures, some cross-legged, and others standing, probably devotees, and one of them a woman.

Neither of these caves have been entirely finished.

There is still another group of these small Viharas, called the Chumarwarra, or, (if I understand correctly,) the Chumars' (or shoemakers') quarter. The first is square, with twelve pillars on the same plan as those at Ajunta, though the detail is similar to the Viswakarma. There are cells, and in the sanctuary Buddha sitting with the feet down; it never has been finished, and is now much ruined.

The second is similar in plan, though the pillars are of the cushion form of Elephanta and the Dehrwarra, but the capitals are much better formed, than in the last example, and more ornamented; the lateral galleries here contain figures of Buddha, all like the one in the sanctuary sitting with their feet down, and there are only two cells on each side of the sanctuary.

The last is a small plain Vihara with cells, but without pillars, and much ruined.

The whole of the caves in this group resemble one another so much in detail and execution, that I am unable to make out any succession among them, and it is probable that they were all excavated within the same century as the Viswakarma.

The next three temples I have to describe are particularly interesting to the antiquarian, as pointing out the successive steps by which the Buddhistical caves merged into Brahmanism. As they have been so often described, I need not repeat the description here, but assume that their form and detail are known.

The first is the Do Tal, or Dookya Ghur, a Buddhist Vihara of two stories; most of its details are so similar to those above described, that it may be assumed to be without doubt of the same age; it is strictly Buddhistic in all its details, and shows no more tendency towards Brahmanism than what I pointed out in speaking of Viswakarma. It apparently was intended to have three stories, but has been left unfinished.

The next, or Teen Tal, is very similar to the last in arrangement and detail, and its sculptures are all Buddhistical, though deviating so far from the usual simplicity of that style, as almost to justify the Brahmans in appropriating them as they have done.

The third, the Dasavatar, is another two-storied cave, very similar in all its architecture and details to the two preceding, but the sculptures are all Brahmanical. At first, I assumed, that the excavation had been made by the Buddhists, and appropriated and finished by their successors. This may be true to a certain extent, but on a more careful examination I am more inclined to think we owe it entirely to the Brahmans. It it evidently the earliest Brahmanical temple here, and it is natural to suppose that when the Sivites first attempted to rival their antagonists in cave temples, they should follow the only models that existed, merely appropriating it to their own worship. The circumstance, however, that makes me most incline to this opinion, is the existence of a pseudo-structural Mantapa, or shrine of Nundi, in the court-yard; this evidently must have been a part of the original design, or the rock would not have been left here for it, and it is a model of the usual structural building found in Sivite temples in different parts of India. And as I pointed out in speaking of the Dhumnar caves, this is a piece of bad grammar the Buddhists never were guilty of; their excavations always are caves, whilst the characteristic of Brahmanical excavation is to copy their structural buildings, a system which rose to its height in the Kylas, which is the next I shall have to describe.

After the successful attempt at a small rock-cut model of one of their own temples, it is not wonderful that the Brahmans should attempt something of the same class on a larger scale, though some powerful motive must have existed to induce them to attempt any thing so splendid as the Kylas.

In it there is no trace of the forms or ordinances of the caves I have just been describing; every thing is Brahmanical, every thing is copied from structural buildings; and had it been cut out of a rock on a plain, (its proper situation,) no stranger would have suspected that it was a Monolith, without at least, a most careful examination of its structure.

If, as I suppose was the case, it was undertaken to mark the triumph of the Sivites over the Buddhist faith, it was a noble idea; and whatever faults may be inherent in the design, we owe to it not only the most splendid excavation in India, but we are also fortunate in possessing a record of the architecture of its date in so imperishable a form, and which may hereafter help us to make important historical deductions.

The greatest fault inherent in the design is the situation in which the Kylas stands, being literally, as at Dhumnar, a temple standing in a pit. From this circumstance, the gateway, or gopura, and screen in front, entirely hide the temple from view outside, and when in the interior court the space is so confined, that the spectator can never get to a sufficient distance to get a good general view, and look what way he will he has always the perpendicular scarp of the pit, higher than the temple itself.

When I first approached the Kylas, it was after a long journey, during the course of which I had visited almost all the Hindú remains between Jaganath on the shores of the Bay of Bengal, and Mount Abu on the borders of the western desert; and I had acquired such familiarity with the style and details of Hindú architecture, that I felt convinced I should at once be able to synchronize this wonder of Ellora with some of the temples I had seen, and even perhaps to affix a date to it. The first glance however undeceived me, as the style was totally different from any thing I had seen, and one might as soon attempt to fix the date of a Gothic cathedral, from having acquired an intimate knowledge of the classic styles. Unlike the temple at Dhumnar, which is an exact copy of the structural buildings in its neighbourhood, this belongs to a southern type, and that type I had not then had an opportunity of seeing or examining; and as I have often said, there are no drawings extant of Indian buildings which will enable an antiquarian to make the comparison without personal inspection.

It was not till the spring of the present year that I was able to complete my survey of Hindú architecture by a tour in the Carnatic, and it was then at Tanjore and Chillumbrum that I found the type I was looking for. It would perhaps be going too far to assert that the builders of the great pagoda at Tanjore were the excavators of the Kylas; and it would certainly take up more time and space than I can afford here to attempt to prove it; but so strong is the evidence, not only from the similarity of styles but also from history, (I should rather say tradition,) that I have no doubt in my own mind, that the Chola, or at least, some of the Karnata Rajas were the excavators of this temple, and the restorers of Sivite worship in the Dekkan; my own impression is, that we must ascribe this to either Raja Rajendra or Keri Kala Cholan, and that consequently the date given by Meer Ali Khan to Sir Charles Mallet is very near the truth, if applied to this excavation, at least, and that it was made in the first half of the ninth century of our era.

The external gateway is exactly one of the gopuras which adorn all the temples of the south, and are unknown in the north; whether it had ever the pyramidical top with which all these are adorned it is not very easy now to determine. I am inclined to think it had, but if so, it would be of brick, as all those are, though their base is universally of granite, to the height at which this one of the Kylas remains.

The colonnade which surrounds the area in which the temple stands, is of course more modern than the temple itself; probably considerably so, as the style is different, and resembles more the northern style than any thing in the temple itself, so much so indeed, that it would almost seem as if the architects had reverted to the familiar types of the caves previously described, after the retirement of their southern friends.

Of a still more modern date is the beautiful temple of Lanka in the northern scarp of the rock, to which I shall revert presently, and to a later date than even this would I ascribe the two-arched Buddhist-looking excavation on each side of the entrance, one of which, that of the north, is only commenced, that on the south nearly finished. It is possible they may have been placed there with the idea of conciliating the Buddhists by the first designers of the temple, but I consider it as much more probable that they have been added at some time, when, for a short interval, the Buddhists may have had the upper hand, and consequently possession of the temple.

I should also mention, that the Vimana itself is the only thing here of a purely southern type, its adjuncts are less so; and the caves, both on the north and south sides, have much more affinity with the northern styles, than with those found on the south of the Kistna.

The next six caves proceeding north, have been so often and so well described, that I may be excused saying much about them; they are usually called the Rameswara, Neelcaut, Teeli ka kanah, Kumarwarra, and the two Chendwassas.

They are all very much on the same plan, and all singularly like small Buddhist Viharas at first sight, so much so, that after being convinced they were Brahmanical I still clung to the idea that they must be appropriations; but this idea must be abandoned, for they are all without cells, and there are arrangements about them never seen in Viharas; and had they been once used by the Buddhists it would have been impossible, in a rock temple, to obliterate the marks of their former destination. Imitations they certainly are, and this is perhaps all that can be said of them; though it is difficult to understand why the Brahmans should have imitated the Buddhists, unless it was (as before suggested) to conciliate the followers of the latter religion, by allowing them to worship the new gods in rock-cut temples, similar to those in which their fathers had worshipped before them.

The architecture of all these temples is of a northern type, and resembles, with some variation, details found in the caves to the south of the Kylas, and at Ajunta, though differing in some respects to suit the two different religions to which they are dedicated.

The Rameswara is the most complete, and its sculpture the best of any temple here, though much in the same style as those surrounding the Kylas.

The most northern of the two Chendwassas is the only Vaishnava temple here, and at the same time the one that looks most like an appropriation, for it has cells, and the sculpture seems to have been interpolated on the original design. The sculpture, however, is so bad that the whole may belong to an age very much more modern than the others.

The next to be described is the Doomar Lena[1], the finest and largest Brahmanical cave excavation here. From its plan and details, there can be no doubt that it was as purely Brahmanical as the Kylas. The plan exactly resembles the Chaöri, or nuptial hall, such as those in front of the great temple at Barolli, and also the one in the fort at

---

[1] Plate No. 4.

Kumulmair; and if I am correct in translating Çhaöri as nuptial hall, as Tod does, the appellation Doomar Lena here given, is the correct one, and not merely a trivial name, derived from one of the sculptured groups, as usually supposed. Indeed, had that been the case, they would hardly have used the Pali word Lena. The only difference between this, and the structural Chaöris, is that here the temple or vimana is inclosed in the cave, while at Barolli, and elsewhere, the Chaöri stands in front of the temple. The same thing occurs in Buddhist architecture, for in all Buddhist countries we find the daghopa outside, and near the temple: in the caves it is placed inside.

Though the architecture of this cave is finished, the sculpture does not seem so complete as at Elephanta, a cave which this one singularly resembles in every respect, both of size, plan, and detail; this, however, is the largest, being a hundred and fifty feet each way, while the other is only a hundred and thirty, and its details are somewhat better finished; though the pillars are so much alike, that it requires drawings made on the spot to detect the difference between them[1].

The sculptures, too, seem intended to have been nearly the same, and on the side of the entrance we find the same figure of Buddha, or, as the people call him here, Jam Dhurm, the Dharma Raja, which puzzles the antiquarian at Elephanta. I can only ascribe his presence to the same system of conciliation which induced the Brahmans to go out of their way to dig these caves at all.

This temple, with the one at Elephanta, if I am correct in the views I have stated above, must have been excavated in the tenth century of our era, a date which I do not think can possibly be far from the truth.

In a nullah above this are several small caves, containing Trimurti busts, and one also exists near the Kylas. They are not remarkable for any thing else, and what I have to say of the busts in question had better be deferred till I come to speak of Elephanta.

There are two caves which I have passed over in the above enumeration, so as not to break the chronological sequence in my description. The first, the Ravana ka Kaie, (Ashes of Ravana,) is situated between the Teen Tal and Das Avatar, but lower down in the hill, and has few points of similarity with those on each side of it. It is a purely Brahmanical cave of a florid style of architecture. In form the pillars resemble a good deal those that surround the court-yard of the Viswakarma, though more ornamented, and it is here that first appears the vase and falling leaf, so common, afterwards, in the temples of northern India. The sculpture is good, and similar to that of the Rameswara in many respects. I have however described it by itself, as there is no cave in Ellora whose relative date I found so difficult to determine. It may possibly belong to the position it holds locally in the series, and would be thus the earliest Brahmanical cave here, and the similarity of its pillars to those of the Viswakarma, rather favour this supposition; but its floridness, the style of sculpture, and the general disposition of the cave, incline me to place it much later, or, as here described, after the Doomar Lena.

---

[1] Plate No. 9.

The other cave is called Lanka, and is situated above the colonnade in the northern scarp of the Kylas; from its position evidently executed subsequently to the great temple, and, from its design, I should think not less than one or two centuries later. Its details all belong to the northern styles, and are bold and good; indeed, as a specimen of cave architecture, I consider it the finest and best designed in the whole series. The pillars, which would be clumsy and heavy in a structural building, are elegant and appropriate when viewed in conjunction with the mass of rock they support. There are very few sculptures, and these are not remarkable either for execution or design. Indeed the cave does not seem to have been entirely finished, or every compartment would, without doubt, have contained some group of sculpture.

The next caves to be described are the Indra Subha group, consisting of four principal caves, and several smaller ones.

In their architecture they differ very considerably from those already described, being generally more ornate, the pillars shorter and more massive, and a species of leaf falling over a vase being here introduced, which does not occur in any of the earlier examples; though something of the kind is seen as above mentioned, in the Ravana ka Kaie, and in the Lanka; indeed the style of the last-named cave so completely resembles that of the Indra Subha, that I have no hesitation in placing them nearly in the same age, though it would be difficult to say which is the more modern.

The sculptures to this group have hitherto proved a stumbling-block to antiquaries, and no fixed opinion seems to have been arrived at regarding them. Buddhist they certainly are not, or at all events of so degenerate a type as scarce to deserve that name; nor are they Brahmanical; and though they certainly resemble Jaina sculpture more than any other, I do not think they can be correctly ascribed to that sect either, at least as we now know it. In no place in these caves do the twenty-four thirthankars appear, nor have the cross-legged figures the symbols which almost invariably accompany these worthies, and are the only means of distinguishing one from another. If, however, I am correct in supposing Jainism to be a sort of compromise between the other two religions, which did not acquire its present form and consistency till after the downfall of the Buddhists, when they were joined by most of that sect who had not embraced the dominant religion, these caves are doubly interesting as showing us the religion in a state of transition from one set of tenets to another.

Be this as it may, I have little doubt that they are the last caves executed here, and I do not think their date can be carried higher than the eleventh or twelfth century of our era. Indeed, from a similarity in some of the details, I would feel almost inclined to ascribe them to Raja Indra Dyumna, who plays so important a part here, and in the building of the famous Jaganatha Pagoda, in Orissa, in the twelfth century; but it would require more knowledge and labour than I can at present apply to the subject, to make out whether this be really the case or not[1].

There is one singularity in these caves that I am unable to explain, which is the form of the pseudo-structural temple in the court yard, in front of the Indra Subha. Like the Kylas, it seems to have come from the south, while the details all round it belong to the northern types; and though its age would by no means interfere with the date given above, its appearance here is singular, and its detail still more so. The difficulty will perhaps only be solved by a more attentive examination of the structural temples of the Dekkan than I have been able to make.

ELEPHANTA.

The great cave at Elephanta has been described so well, and in such detail, by Mr. Erskine, in the Transactions of the Bombay Literary Society, that I may be excused saying much about it.

The rock here is much harder than at Ellora, and all the details are consequently cut with more precision, and better preserved, than in the caves there; but neither the outline nor general design are better than in the sculpture of the Hindu series there.

The great cave, as I said before, is of the form now called a Chaori, and differs from the one at Ellora only in the position of the Ling chapel, or sanctuary; and the great Trimurti bust, which may have been intended, in the Doomar Lena, for the space opposite the entrance, is there left blank, though the position of the sanctuary renders this improbable. The great bust is now generally allowed to be of Siva alone, and I will not add anything to the discussion, further than by mentioning that at Barolli there is a bust of large dimensions, and almost exactly similar to this; but being cut in fine hard stone, all that remains of it is more easily distinguishable than here. The centre face, however, is unfortunately entirely defaced, but that on its right has a chaplet of skulls, and the "frontlet eye" open, and an angry and animated expression of countenance. The face on the left has also the frontlet eye distinctly marked, but as no eyeball is shown, I presume it is meant to be represented as shut; but what adds particular interest to this bust is, that over it, on the same stone, are full-length statues of Brahma and Vishnu, the former over the right face, with his three (query four?) faces, and his Vahana, the goose, the latter as usually represented, with his four arms, and the gadhi, chakra, &c., circumstances which quite put to rest the idea of the bust itself representing the three persons of the Trinity, nor can I concur with Colonel Sykes in supposing the left face to be Parvati. The three I believe to be Siva, as creator, preserver, and destroyer; an assumption of the attributes of the other two ascribed to him by his votaries when his worship became dominant.

---

[1] See Introduction to Wilson's Catalogue of Mackenzie's MSS., p. cvi.; also Asiatic Researches, vol. xv., p. 316; and Dr. Buchanan Hamilton's Statistics of Bagulpur, p. 23.

In a ravine running from the great cave across the island, there are two other caves, similar in plan to those situated between the Kylas and Doomar Lena, at Ellora. These unfortunately, however, are so much injured by the falling of the rock and the damp, that it is impossible to make out more than their dedication to Siva, and a general similarity to those of Ellora, with which I have no doubt they are cotemporary: indeed there is a degree of similarity between the two series which is singular in structures so distant, and which can only be accounted for by their being undertaken at the same time, and probably under the same direction.

I could find no trace of Buddhism in the whole island, and these, therefore, are perhaps singular, as being the only purely Brahmanical series in the north of India; for though those at Joyghesir and Montpezir are likewise purely Hindu, and apparently of the same age as these, they are situated in the same island, and so nearly in the vicinity of the great Buddhist series of Kannari, that the motive before ascribed, as inducing the Brahmans to become cave diggers, applies to them.

MAHAVELLIPORE.

One only series remains now to be described, and which, though not so magnificent or extensive as some of those which have already passed under review, still possesses peculiarities and distinctive features, which render it scarce less interesting to the artist or the antiquary.

Like Ellora, however, it has been so often described by Europeans, that little remains to be added to what has been already published on the subject, first by Messrs. Chambers and Goldingham in the Asiatic Researches, and afterwards, with more precision, by Mr. Babington, in the Transactions of the Royal Asiatic Society. The notices of Bishop Heber and Mrs. Graham are also interesting, though not bearing on the present subject of inquiry.

Between Covelong and Sadras, a long sandy ridge extends near forty miles, bounded on the east by the sea, and on the west by a salt-water lagoon, now dry for the greater part of the year. Towards the southern extremity of this ridge, a number of masses of granite rock protrude through the surface, so numerous and large in one spot as to form a hill about a mile in length, with half that breadth, and rising to the height of about a hundred or a hundred and fifty feet; and it is in this hill that the principal antiquities are situated, consisting of some half-dozen of caves in various states of progress, one pseudo-structural temple, and the famous bas-reliefs. About half a mile to the south of this, are the five raths, and on the rock jutting into the sea, due east from the centre of the hill, the famous structural temple, known as the remaining one of the seven pagodas, from which the place takes its European name.

The most completely finished cave here, (for none is entirely so,) is the small one in the ravine, figured in Babington's ninth plate. It is architecturally complete, though its sculpture is not quite finished. The finest cave, however, is the one containing the fine bas-relief of Kali killing Mahaasura, (see plate 4 in Babington's description) by far the finest piece of sculpture here, and equal to anything at Ellora. The frontispiece of this cave, however, is merely blocked out, and its cells are unfinished. Like the others it is small when compared with the northern caves, being only thirty-two feet ten inches, by fifteen feet six inches, in the interior, exclusive of the three cells; the centre one of which is occupied by Siva sitting on Nandi, with Parvati and Sobramuni, and above them Brahma and Vishnu. In form and detail this cave may be compared to the Rameswar at Ellora, or perhaps rather to number seven at Ajunta. It cannot, however, be so old as either of them, as the architecture is poorer, leaner, and its details resemble much more those used in structural buildings of a more modern date than the massive style of cave architecture that distinguishes these specimens[1]. That it is a copy from these caves can scarcely I think be doubted, but not one of the same age.

Immediately above this cave, and apparently intended to form part of the design, is the base of a structural vimana of the same age and style; the part remaining is of granite, and it probably never was finished, or if the pyramid was built of brick, as is the universal custom in the south, it probably has fallen down. This is the only instance I am aware of such an adjunct, though they may have been common in Brahmanical caves.

Opposite the front of this cave, at the distance of a few yards, the workmen have commenced to hew a temple out of an immense block that stands there; its form is scarcely distinguishable, but it is interesting as showing the mode in which the workmen set about an undertaking of this sort, which was simply to divide the rock into squares of about twelve and eighteen inches, by channels two and three inches deep, and then to split off the remaining mass, which the tendency of granite to exfoliate easily enabled them to do.

There is another pseudo-structural temple of nearly the same size and design as this one was intended to be, at the northern end of the hill, and which is nearly, though not quite, finished.

Immediately behind the present village temple, and about half way between the two caves above-mentioned, is the great bas-relief so often figured, though never so well as by Mr. Babington, in the paper above referred to. The elephants are good, and so are many of the figures, particularly the ascetic; but the whole wants unity of design and purpose, and is inferior in every respect to the Kali sculpture in the cave above, to many of those at Ellora, and to all the sculptures of Elephanta. The rock, too, has not been smoothed away between the figures, which gives the whole an appearance of not being finished, and isolates the figures and groups in a very disagreeable manner.

Adjoining is an unfinished excavation very like (in plan), to the trimurti cave near the Kylas, and a little further to the south the other large bas-relief, which, though of the same age, is of inferior execution to the great one.

The five raths are situated about a mile south of the hill in the direction of its axis, and though small, and of course unfinished, (like everything else here,) are as pleasing examples of their style as any I know. They possess an immense advantage over the pseudo-structural temples of the north; for being cut out of detached masses of granite, they stand alone in the sand, and are in every respect so like structural buildings, that it requires some examination to convince one's self they are not so. They have also the advantage in material, being cut from a fine, bold-grained granite, of a reddish tinge. It has, however, a tendency to split, which the trap of the north has not, and exfoliates when long exposed to the weather.

---

[1] Plate No. 10.

Daniell's views of these temples, and the various descriptions extant, have rendered them so familiar to the public that I need not say more regarding them here; though I much wish that the elaborate architectural drawings made of them for Colonel Mackenzie could be given to the public, as they would afford juster notions of what Indian antiquities really are, than any thing that has yet been published.

I could not find in any of the temples or sculptures here the smallest trace of Buddhist worship. Every where Siva appears as the presiding deity, though with a singularly liberal allowance of Vishnuism. In the cave first mentioned so completely is this the case, that it might almost be called Vaishnava; and in the second the pendant to the Kali bas-relief is a Vishnu reposing on the Ses Seja; and in the raths the only cell that is occupied is occupied by Lakshmi, though this arises, I believe, from the unfinished state of the others; for they were certainly intended to be dedicated to Siva. It has been doubted to whom the temple on the shore is dedicated; and its sculptures, those at least on the walls, have been so corroded by the sea air, that they cannot well be made out; and though Siva and Parvati appear on two separate bas-reliefs, occupying the principal places, they may not be integral, and the large figure drawn by Babington, plate twelve, is Vishnu on the Ses Seja, extremely similar to the one in the Kali cave, while the broken Sthamba in the central apartment may or may not be a Lingam, though I myself have little doubt that it is, and that the temple was Sivite.

One of the most singular characteristics of this series of caves is that they are all of one age, and probably the work of one prince, who has carried on the works simultaneously, but from some cause or other has been unable to complete even one of them; had one been finished, or had there been any gradation of style or workmanship, some chronological arrangement might easily have been traced; but nothing of the sort exists, at least among the monoliths, and the temple on the shore does not fall strictly within my present limits, though I may mention that its age does not differ materially from that of the rest.

If the north owe its Kylas to the Chola mandalam, which I believe it certainly does, the south as certainly owes these Monoliths to the Dekkan. There is nothing here of which the prototype cannot be traced in the caves of the north. In plan and design they resemble the Hindu series at Ellora, though many of their details are only to be found at Ajunta and Salsette; and it cannot be supposed that two people, unless copying from one another, could have invented the same details in so short a period as could have elapsed between the excavating of these, and those of the northern caves; and besides, no one, I believe, will doubt, after what has been said above, that cave architecture is indigenous in the north, while these are the only specimens found in the south.

Passing by those traditions which refer to Maha Bali and the Gods, which at all events have no reference to anything now existing here, there are two which bear an appearance of great probability. The first mentioned by Mr. Goldingham, vol. v., Trans. A.S., p. 74, thus:

"A northern prince, (perhaps one of the conquerors,) about one thousand years ago, was desirous of having a great work executed, but the Hindu sculptors and masons refused to execute it on the terms he offered. Attempting force, they (in number about four thousand,) fled with their effects from his country, hither, where they resided four or five years, and in this interval executed these magnificent works. The prince at length discovering them, prevailed on them to return, which they did, leaving the works unfinished as they appear at present."

The second is from the Mackenzie MSS., as abstracted by Mr. Taylor, in the Madras Journal, No. 20, p. 65.

"In the Cali Yug, Singhama Nayadu, the Zemindar of the Vellugotivaru race, seemed to have ruled here. In that time, during a famine, many artificers resorted hither, and wrought on the mountain a great variety of works during two or three years."

Who this Singhama was appears from another MS. in the same collection, (M. J. No. 19, p. 373,) where, speaking of this race, it is said, "Vennama Nayadu became head of his race. His son was Yiradacha N., who with his cousin were successful in their incursions against neighbouring places, extending to Canchi and to the Pandya kings. The Mussulmans are also mentioned as beaten in defence of another chieftain. The son of Vennama, named Singhama Nayadu, became the head of this race."

The thousand years of the first quotation I look upon as the usual Hindu synonym for "some time ago," while the allusion to foreign conquerors seems to point to the only event I am aware of that would give probability to the tradition, namely, the invasion of Deoghur by Alla-uddín, in the end of the thirteenth century; a supposition rendered probable by the extracts from the Mackenzie manuscripts; for though no date is there given for Singhama's reign, it appears in the context that his grand-uncle or great-grand-uncle, was engaged in the revolution that placed Pratapa Rudra on the Ganapati throne, A.D. 1167, and he therefore flourished in the thirteenth century, probably towards the end of it. The allusion to the Mahomedan in this extract also renders this still more likely, as before Alla-uddín they scarcely meddled in the affairs of the south.

Though this evidence appears tolerably conclusive, I should not be inclined to rely upon it were it not corroborated by the internal evidence of the caves themselves. But altogether I fear five centuries and a half is all the antiquity we can allow to these boasted monuments of primeval times.

Singhama's death in the field, before the fort of Jalli Palli, is still more probably the cause of the sudden interruption of the works, than the reconciliation of the workmen with their northern master; it being entirely a fancy of his own, and neither indigenous in the country, nor a part of the religion of the people, it is not probable that his successor would continue the follies of his parent.

There is one other means of fixing approximately the date of these temples, to which I have not alluded, and on which I am incapable of forming an opinion; I mean the date of the characters inscribed on the large rath over the figures there. Their form, and Mr. Babington's being able to translate them, does not say much for their antiquity, though their general illegibility does, I confess, argue a higher antiquity than I have ascribed to the buildings.

Had any one done for the Alphabets of the south what Mr. Prinsep did for those of the north, the question would be easily determined, but till that is done, I fear this mode of proof is scarcely available.

In concluding this paper I would wish to add a few words on the present state of the caves, and on the means that might (and I now hope will,) be taken to preserve them from further injury before it is too late.

Those of Cuttack are, as I mentioned above, inhabited by Hindú Fakírs, but as they are not used as places of worship, or esteemed sacred by the inhabitants of the country, an order from the magistrate would, I conceive, be sufficient to dislodge them, and without interfering with any religious feelings of the people, which the Government are justly so careful of offending. If this were done very little trouble or expense would be required to remove the mud walls and rubbish they have accumulated, and thus restore to view these very interesting monuments.

Unless, however, it is intended to make and publish accurate drawings of the series, and to take some measures for their protection in future, it is scarcely to be wished that this should be done; for there is little doubt, judging from what has happened in other places, that a few pic-nic parties from Cuttack or Puri, and the destructive pilfering of a few would-be antiquarians, would do more harm in a few years, than has been done by their present occupants in centuries.

The caves of Ellora, Salsette, Junir, &c., are entirely deserted as places of worship, and therefore easily accessible to all Europeans. Their stucco and painting have however almost entirely disappeared, but their sculptures are not so easily broken, and are on too large a scale to tempt the cupidity of most collectors.

The cave at Elephanta being situated so near Bombay, was more exposed to injury than any of the others, and much was done, till Government at length appointed an invalid serjeant to look after and protect it; since that time it has been tolerably well cared for.

The great cave at Karli is now, strangely enough, taken possession of by the Brahmans, and considered a temple of Mahadeva. How far, therefore, interference with it would be practicable I do not know; access, however, is allowed to any strangers, and there are no paintings or sculptures which are likely to be injured by its present occupants, or even by English tourists.

The only series, therefore, that demands immediate attention is that of Ajunta; the caves there are entirely deserted by the natives, and are only visited by Europeans.

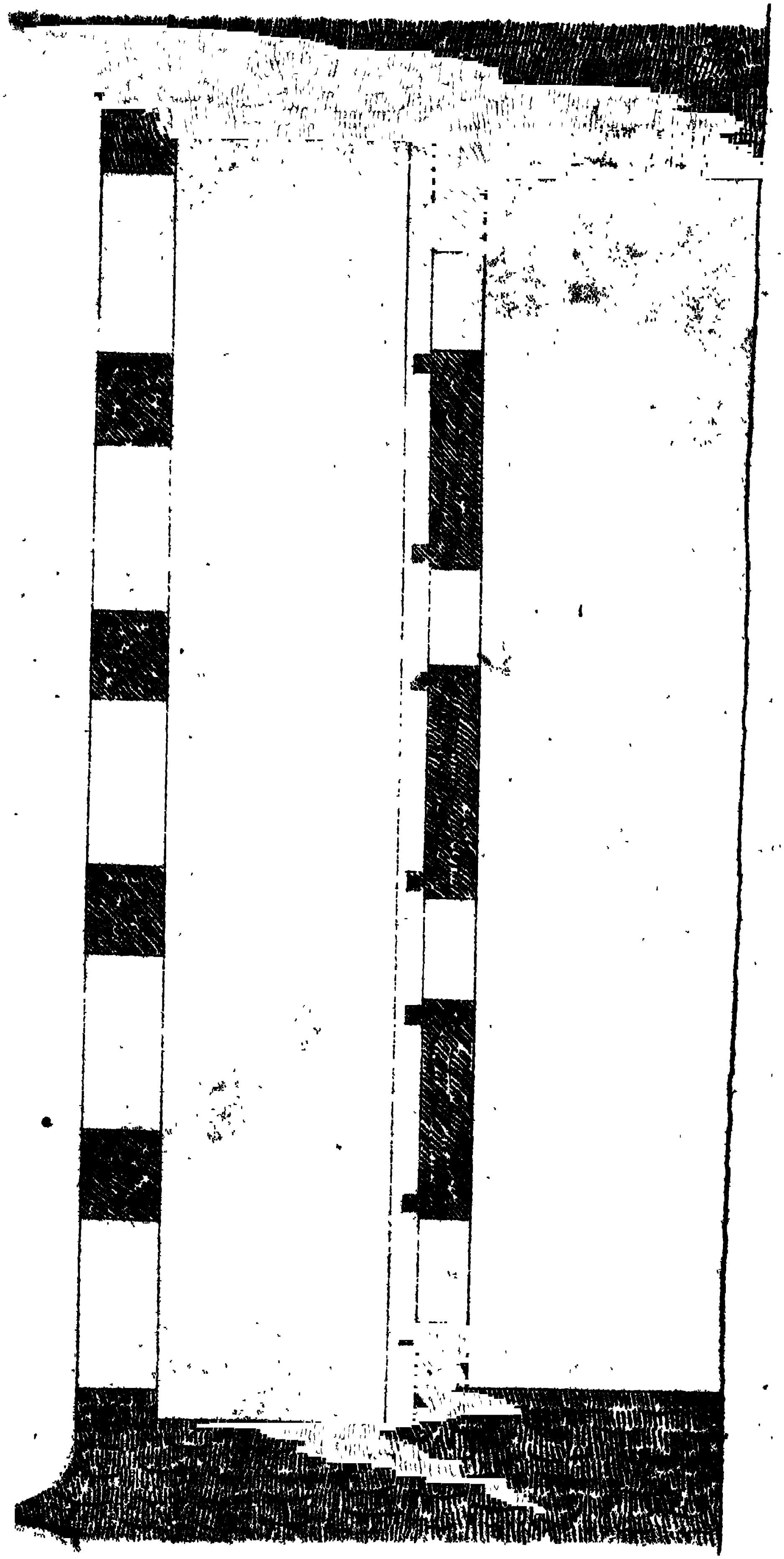
As I mentioned above they still retain the greater portion of their original paintings, but that is fast disappearing, and a traveller who would now visit them, will miss much that I saw a few years ago.

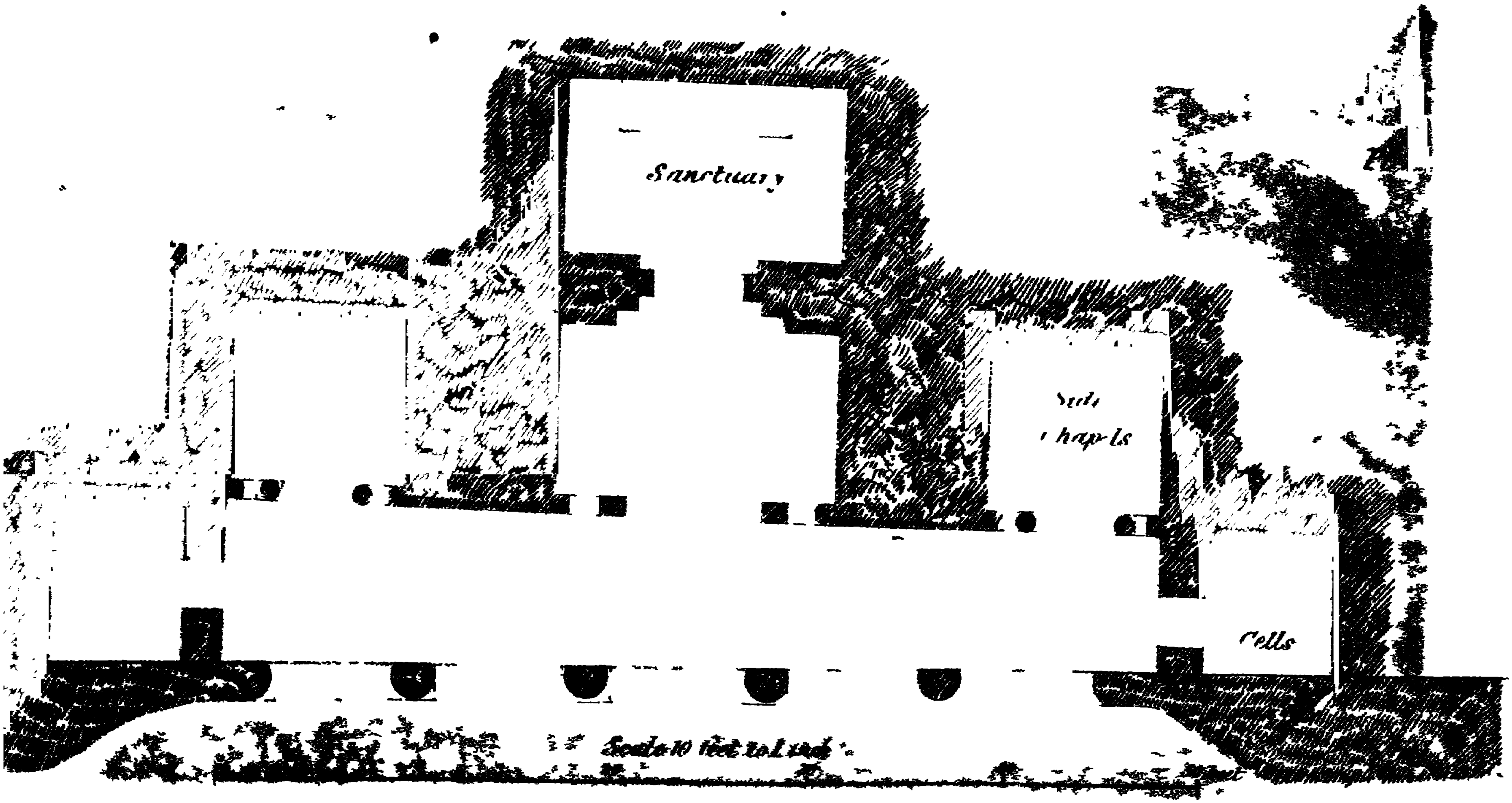
It is sad to think that after standing so many years an exposure to so destructive a climate, after escaping the bigotry of the Moslem, and the rough usage of the robber Bheel, they should be fast perishing from the meddling curiosity of the Europeans who now visit them. But such is unfortunately the case; for few come away without picking off one or two of the heads he thinks most beautiful or interesting, and as most of them are reduced to powder before they reach their destination, they are lost to the world for ever. The only instance of this I can refer to in print, is in the Journal of the Asiatic Society of Bengal, vol. v., p. 561, where it is stated, that Dr. Bird peeled four figures off the Zodiac in cave No. 17, and this is unfortunately not the only instance that has fallen under my observation.

I have now brought to a conclusion the remarks I had to make on the Cave Temples of India, which have extended to a much greater length than I supposed they would do when I originally undertook the task of compiling them. The number of objects, however, to be described is so great, that I have found it impossible to compress into shorter limits the foregoing descriptions, with the few remarks that were necessary to render the subject intelligible. Indeed, I am afraid that I am equally open to the opposite accusation of abruptness and obscurity from attempting too great conciseness; but I must be allowed to plead as an apology for this fault, as well as for the want of polish of style that pervades my descriptions, that in almost every instance, I have copied word for word in this paper the notes I made on the spot and in the caves themselves. By a little amplification and attention to style it would have been easy to have rendered the paper much more readable, but this would have added to its length, which is already too great; and besides, might, in describing objects so long after they were visited, have rendered my descriptions less correct, and thus have taken from them the only merit to which they can fairly pretend. I may also add, that when this paper was first written, it was my intention to have published at the same time, in a folio form, some eighteen or twenty of my sketches of the caves and temples described in the text, which, when taken with the illustrations now given, would, I conceive, have added much to the interest of the subject, besides supplying many of the deficiencies of the descriptions, of which no one is more fully aware that I am.

I regret, however, to say, that I have not as yet been able to find any publisher willing to undertake the publication on satisfactory terms, nor has the project met with sufficient encouragement in any quarter to which I have hitherto referred it, to induce me to undertake the risk and annoyance of bringing it out myself and on my own account; I am not, however, without hope that this may still be accomplished.

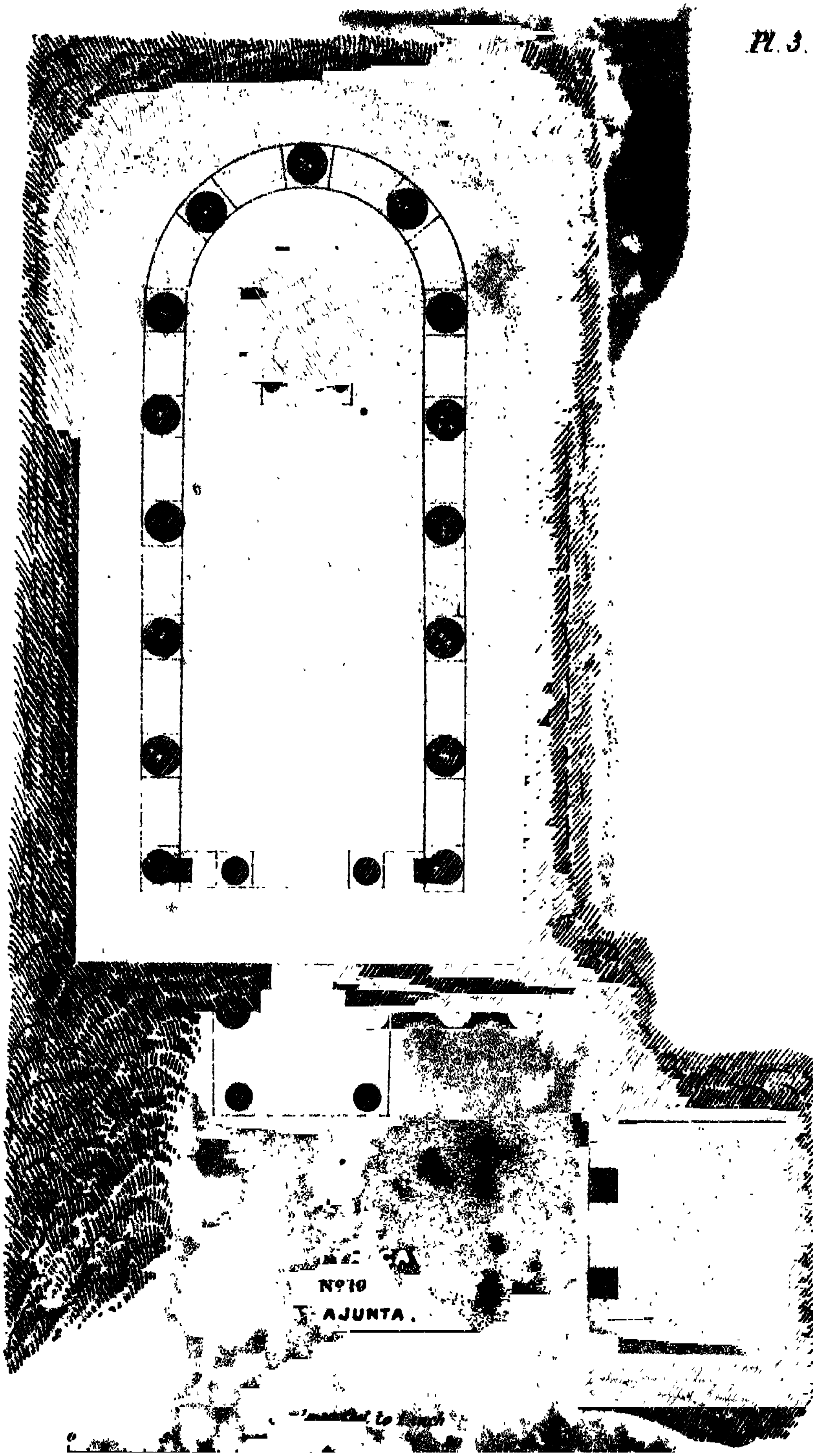
Since the foregoing paper was read, a Memorial was presented by the Council of this Society to the Court of Directors on the subject of these caves, to which I am happy to hear they have responded; and orders have, I believe, been forwarded to the different Presidencies to employ competent persons to draw and copy the antiquities and paintings in each district, and thus we may at last hope to have these caves illustrated in a manner worthy of their magnificence and great historical interest. I only hope the subject will not now be allowed to drop till every monument of ancient India has been thoroughly examined and detailed, and we may thus escape the hitherto too well merited reproach of having so long possessed that noble country, and done so little to illustrate its history or antiquities.





PLAN OF VIHARA CAVE No 2 AT AJUNTA

Pl. 3.



Art. III.—*Notes on Indian Agriculture, as practised in the Western or Bombay Provinces of India; by* Alexander Gibson, Esq., *Superintendent of the Botanic Garden at Daporee.*

Read 15th June, 1844.

I do not offer these notes for perusal in the idea that they communicate any thing very new, neither do I suppose that from their contents can be elicited any thing likely to be of solid benefit to the more enlightened agriculturist of Great Britain; as little do I fancy that they can possess even a tithe of the interest which must attach to a detailed description of the careful cultivation practised by the industrious Chinese husbandman. Still, I deem it possible, that they may in some points not be destitute of interest:

1st. As showing that the agriculture of India is not altogether of so rude or slovenly a character as it is often supposed to be.

2nd. That many of the means and instruments used, albeit simple, are yet well adapted to attain the end in view.

3rd. That much of what is bad in the husbandry of India, is owing rather to the faulty framework of the social system of the Hindús, than to any natural want of acuteness.

4th. That until the habits of the people as regards their social system, be in some measure changed, little or no alteration in the present routine of practice is to be looked for.

The remarks which have led me to form the above general conclusions, will be found scattered among the details given hereafter. Having premised thus much, I will proceed to notice separately the modes of cultivation of the various Cereal Grains, Legumes, Oil-Plants, &c., in common use.

1st, Wheat.—Is grown chiefly above the Ghàts in the Dekkan, Kandesh, and the Carnatic; also most extensively in Gujarat, even to the sea border. Farther south, the climate and soil under the Ghàts, do not admit of its being grown. It is also extensively raised in many level table-lands met with before the Ghàts soften down to the flatter plains, and on such high levels the same measure of grain is found to weigh about one-quarter more than a similar quantity raised in the more plain country.

Wheat is universally sown as a crop of the cold season. The land intended for it, however, receives its first preparation either in

November or December of the previous year, or after the first rains in May of the year in which it is to be grown. In Gujarat, this preparation consists in ploughing three or four times with the two bullock plough. A deeper-going instrument is deemed prejudicial as bringing up an inferior sub-soil. In the Dekkan, the land is most generally prepared with the six bullock plough, while in the more southern districts, bordering on and in the Carnatic, a plough of from twelve to sixteen bullocks is in general use, but is not had recourse to in the same land till after a period of twelve years; and often besides a ploughing with the great plough, the land has to be hand-dug to root out the Haryálí grass, so destructive to crops.

The land having been thoroughly broken up and cleared of grass-roots by ploughing, digging and hand-picking, is left to be beaten down by the action of the rainy weather. In September it again undergoes a slight preparation by the knife-harrow, koolas, (kulava?) and on the weather being deemed favourable, the seed is sown by the simple drill harrow of hollow bamboos, converging upwardly into a cup, and spreading below, so as to allow of the lower extremity of each being inserted into a thick and hollow harrow tooth tipped with iron. Rain falling after germination is deemed to lessen the value of the crop, but a few heavy showers after it has attained the height of three inches materially assist its growth. The reason of the idea is sound and apparent.

The land best fitted for this growth is the strong black soil, which may be called our oldest alluvial, dating probably from the period when the world was a mass of lakes; hence, where this black soil is found in greatest quantity the country is a perfect level. In the best tracts of such soil no artificial manure is ever required. The soil itself seems, owing to the predominance of calcareous matter in a state of very minute division, to have the property of converting every leaf-blade and stick which falls, into a substance identical with itself, in a very short space of time. This may be one reason why manure is not required.

Rotation is certainly necessary and universally practised, but not always until two or three crops in succession have been taken from the ground. Wheat is esteemed a very exhausting crop, or as the natives say, "its roots are foolish." A person attempting to take a crop of sugar-cane after wheat, even supposing that he manures largely, is sure to fail. This I have more than once had occasion to see.

In the best black soils, the power of retaining moisture is so great, that a wheat crop sown, will, without the aid of any after-showers, but simply by the retained moisture and the action of cold air, turn out full. The rationale of this action of the cold I have not heard explained, but the fact as to its materially aiding in the growth of wheat and other grain is universally admitted. Should rain fall after the ear has begun to fill, the effect is most prejudicial, nay, even the prevalence of a southerly wind, which brings with it the moisture of the sea, is hardly less so. The effect of either of these is to produce a red smut with mildew of the ear, so that in an extent of many acres not one hundred pounds of grain may be reaped.

In some seasons, also, rats are epidemically destructive. For instance, in 1834-5, I recollect that in some districts large remissions of revenue had to be given on this account. The wheat once sown requires no farther care until the reaping season. It is then pulled, bundled, and the shares of the village establishment having been duly paid to them, the remainder is trodden out on the threshing floor. The chaff is carefully set apart as a most necessary provision for bullocks, and stored until the season when other provender is scarce. I believe, that but for this chaff, the cultivation of wheat would be by no means so extensive as it is, for the grain is not so certain a crop as some other crops are. It is also a necessary part of rotation.

Of varieties of wheat which I have seen grown in India, the number is six. Of these, may be first mentioned, Bakhshí, also called Daood Khani, in allusion, doubtless, to its northern origin; these two are very nearly related if not identical; both give a superior flour, best fitted for white bread, sweetmeats, &c.; the first is always raised on irrigated land; the second is a dry crop fitted only for the best soil. I find that the produce does not generally exceed twelve hundred pounds per acre, and is most frequently short of this quantity; the price at which these wheats sell is higher than that of other wheats; but it varies according to situation, season, &c., from sixty pounds to ninety pounds per rupee, *i. e.*, it may be said to vary from ten to sixteen shillings per quarter. In Gujarat, however, the produce may be larger than that above-mentioned.

The tax on an acre of the best wheat ground, may in Gujarat amount to eight or ten shillings. In the Dekkan and Carnatic border, the rate of such ground, per acre, will probably vary from two to five shillings under the new survey. Each acre of wheat will, in addition to the grain produce, be expected to yield chaff to the value of two rupees.

The other varieties of wheat are,—

2nd, Kathí. Inferior to the last in colour and quality, but rather superior in quantity of produce.

3rd, Pothí. Inferior to the last, but suited to poorer and even to grey soil if manured.

4th, Kowrí or Khapale, Do. Do.

5th, Tambari. Inferior to all of the above.

6th, Beardless wheat. Not common here, but grain fine. Said to be common at Delhi.

The tax on the land whereon it is raised may not exceed one and sixpence or two shillings.

As to the storing of the crop, this in a tropical climate, where animals of every description abound, is a most essential part of rural economy. The granaries are always underground pits, excavated in sloping places, or places where the sub-soil is hard and dry; these pits are from six to eight feet in depth, closing to a narrow mouth; and having the bottom well puddled with clay, and the sides lined with thick ropes made of the leaves of sugar-cane, or other dry material, twisted; over these, teak or any other large leaves are carefully built as the filling proceeds; and the mouth is closed by grass beaten down and puddled over with earth. The leaves of the Ním-tree are usually put in along with the grain, as they from their bitter quality, have some power in warding off attacks of the weevil or other insects.

In countries where dry grain is much grown, the number of these subterranean receptacles is so great, that an elephant driver will most reluctantly and carefully pilot his animal through the quarter of a city where the grain shops are, from the fear of the hollow ground giving way under the elephant's weight. In a year of scarcity (and fortunately these are becoming less and less common under our Government,) the value of such receptacles is fully felt.

At present prices, a quantity of wheaten flour sufficient for a meal for two natives, may be purchased for about one penny, and as the wages of labour on this side of India, rule at from four to eight shillings per month, it will be obvious that the number of persons who can afford to feed on wheaten flour, is large. The greater proportion, however, of the labouring population seem to prefer as a food, the cereal next mentioned.

Bajri (*Holcus spicat.*)—This grain is a staple of first importance as an article of food for the working classes, and, indeed, many of the higher ranks, especially Mahrattas, prefer Bajri to wheaten bread. It is generally believed to be the best food for a man who has to labour hard.

It is grown extensively in Gujarat, the Dekkan, and Kandesh.

It does not flourish below the Ghâts southward, neither does it appear to be grown in the Carnatic provinces. The soil which best suits it is a brown mould, partly composed of red and partly of black soil; though this be its most choice habitat, it will be found growing in all the coarser varieties of soil up to the merest detritus of trap rock, forming the lower shelves of hills. In the sandy soils forming the borders of the Northern Desert or Run, it will be found growing luxuriantly.

Bajri land is generally ploughed and turned up as soon as possible after November; it is then ploughed and cross-ploughed, and allowed to benefit as much as possible by the action of the sun in the hot weather; after the first heavy rain of June, and from that time until the 20th of July, the final preparation is given by the knife-harrow twice run over the land. Weeds are carefully collected, heaped, and burned in the land, and manure, if procurable, is then spread. The grain is now sown with the common drill sowing machine, and the ground is then smoothed down by the drill machine inverted, and kept down by the weight of one or more men.

When the crop has reached the height of four or five inches weeds and grass are removed, and the plants are clustered up by a light bullock-hoe, composed of two pairs of horizontal iron brackets fixed in frames, and at such distance as to sweep the edges of each drill, removing weeds in their progress, and also loosening and turning up the earth before them. The cost of a pair of such hoes may be about one shilling; they are very effectual for the purpose intended.

From this time until the grain has eared no farther care is requisite; should timely showers, usually looked for in August, fall, the crop will probably be abundant; but even should these fail at the appointed season, the plant is very tolerant of long drought; much rain is injurious, particularly in the shallower and sloping soils; in these, the under stratum being nearly impermeable to water, this is accumulated about the roots of the plants and speedily rots them, especially when no manure has been given. In parts of the same field, the manured portion may often be seen to retain a dark and healthy green hue, while the unmanured portions are of a sickly and dying yellow. The grain having been formed, the next care is to preserve it from birds, such as sparrows, parrots, &c. These animals are most destructive, particularly if trees happen to be situated near to the field; when this is the case, it must be watched from sunrise to sunset, and for this purpose members of the peasant's family relieve each other on a stage erected in the field, and with cries, slings, and stones, keep the birds at bay. The grain having ripened, it is stacked to await the peasant's leisure for threshing.

In threshing, the heads are first separated from the stems; this is performed by women, who, if hired, are paid at the rate of six pounds and a half of grain per one hundred bundles or sheaves of the straw thus separated. It has often occurred to me that a small and simple machine, like the model of a loaded guillotine, might be made efficient in chopping off the heads of grain. The chief obstacle to this, would consist in the different lengths of the straws composing a bundle; a machine of this kind would save a vast quantity of manual labour.

The produce of an average crop per acre, will be found to be about six hundred pounds; but in rich districts, such as Gujarat, one thousand pounds will be nearer the quantity.

The straw is in many districts the only resource of the peasant for cattle-forage, and therefore is most carefully stored, but it is very inferior in nutriment to the straw of millet, or Jowari. The amount of straw per acre may be about six hundred bundles, value about one rupee ten annas, or three shillings.

As to the price of the grain itself, I conclude that the ryot can seldom, except in Gujarat, realise a gross product of more than four rupees per acre, and on poor unmanured, watery, or rocky lands about two rupees per acre.

The tax on land fit for Bajri, may be in Gujarat from two to four rupees per acre; in the Dekkan, &c., at least under the new survey, I believe, that one rupee eight annas may be the maximum, and six annas the minimum, giving an average of fourteen annas; the chaff of this grain is not eaten by cattle.

In the poorer soils along with Bajri, is always sown a small Legume (*Hoolga, hullowla*)[1]; this is hardly in flower when the Bajri is taken off; it is left to ripen and may give about one and a half maunds per acre.

In the richer soils, Túr (*Cytisus bajari*), is commonly sown in the alternate rows, and is also left to ripen after the crop of Bajri is taken off.

The selling price of Bajri in the inland districts can be hardly quoted as higher than one hundred and fifty pounds per rupee; since the abolition of transit duties it has been exported to the coast districts in much larger quantities than was formerly the case, and this has had some tendency to equalise prices. It is reckoned as a very sanatory rotation crop; it is also subject to fewer casualties than are most of the other cereal grains. Alone it is not given to horses, being esteemed too heating, but mixed with math (*Phaseolus aconitifolius*), it forms an excellent food.

---

[1] Mahratí, Hulagá or hulagí: Dolichos biflorus.—*Editor.*

Great Millet (*Holcus sorghum*). Millet is a grain very extensively cultivated in this Presidency, throughout Gujarat, Kandesh, the Dekkan, and Carnatic, but in the narrow strip of coast composing the two Conkans, it is not suited to climate or soil, and consequently is never raised. In the rich black plains of Gujarat or Kandesh it may often, indeed most generally, be seen twelve feet high; in these black soil districts it is the established rotation crop for cotton and wheat.

The first variety, or red Jowari, is sown immediately after the first fall of rain in June. The land requires little preparation, as it had been in former seasons either prepared by trenching or by ploughing, and freed from all weeds; thus, the only farther preparation necessary in sowing Jowari is to run the knife-harrow several times over it, and afterwards to sow with the drill machine before-mentioned. The plant is afterwards earthed up or weeded with the bullock hoe; watching is required as in the case of Bajri, and unless done by the peasant's family, constitutes a considerable item of the expense of the crop; it ripens in October, and is pulled, stacked, and the ear afterwards separated by manual labour.

The second variety, or White Millet, is sown in the end of August or beginning of September; this is a much lower growing grain than the first, but the ear is greatly larger, fuller, and both grain and straw are superior. The straw of this last contains much saccharine matter, and is wholly consumed in forage; whereas, of the first only the leaves and tender ends are eatable, while the entire stem is rejected by beasts. In quantity of grain this cereal is most productive, two thousand five hundred pounds per acre being a common crop in good soil.

The growth of the second variety is confined to the more inland and open country, particularly to those districts, which from their situation, get showers in October or November, the commencing showers of the Madras monsoon. It is a crop which bears a good deal of wet without injury to the straw, particularly when manure is used; cold has a beneficial action on the filling of the ear, but the least excess of it kills the plant, and this blight takes place chiefly in situations near a running stream, where the cold is a degree or two greater than that of the surrounding country. Should frost occur, which is sometimes the case, whole fields are immediately dried up. It is a beneficent provision of nature that the straw of this grain should most abound in the black soil districts in which cotton is raised, and which are generally destitute of pasture ground.

For the transport of an article so bulky as cotton, large numbers of bullocks are required; the Jowari straw can be afforded at a rate so cheap, as to be accessible to the poorest; the price varies according to situation, season, &c., from four to fifteen rupees per thousand bundles, and the size of these may be judged of by the fact that ten of them form a load for a man. The straw, particularly of the second variety, is very nutritive; it is carefully stored up as a resource in case of a bad season. In Gujarat it is stored in houses; in the Dekkan and Carnatic, I remark that it is preserved simply by overlaying the sloping stacks with clods of the black soil; these are beaten down by the rain into a uniform mass, which forms a hard crust over the stack. This straw is the principal food for elephants and camels in countries where trees and shrubs are scarce.

This cereal is often sown solely for the sake of the straw; this is done in districts where other pasturage is scarce, but where the means of irrigation are abundant; when sown for this purpose, sowing takes place in March, in ground well manured; it is sown very thick, as length of straw and not weight of ear is the object. It ought to be fit to begin cutting by May 15th, and a careful husbandman calculates on having a supply sufficient for his bullocks until the first rank grass of the rains gathers some heart and is fit for food; it is cut green, and the quantity required for daily consumption is cut, and the remainder left standing. In seasons when from deficiency of the early rain forage is scarce, this straw can often be sold standing, at the rate of about fifty rupees per acre.

In a poor country, such as that which forms a large portion of our Dekkan province, where there is almost always an under supply of forage, every fair means should be taken to encourage the extension of a cultivation so essential for the preservation of animals as this. It is therefore with sorrow, I remark, that under the new survey now in progress, a tax on wells, even of the most common description, is being re-imposed. Since the total abolition of well tax in the Poonah zilla which took place about seventeen years ago, the ryots have exerted themselves in vastly multiplying the means of irrigation. We may now look for a complete check to this spirit, and it seems too probable, that even many wells now in use will be thrown up.

The selling price of millet may be quoted as varying from one hundred and forty to one hundred and seventy pounds per rupee. It seems to form the principal food of the inhabitants of large cities, artisans, weavers, and others whose employments are sedentary. A quantity sufficient for two meals may be purchased for about a halfpenny.

The roots of the crop of a previous season are thrown into embankments to help in binding together the soil. Every good cultivator constructs such embankments when the soil of his field is at all sloping, and consequently liable to be washed away. Sometimes they are done by the labour of his own household, but more generally under contract with wirdars, a class who travel about the country performing work of this kind.

ELEUSINE CORACANA (*Natcheny, nágalí, maud*).—Cultivated principally as a hill grain, but also in the plains. *E. stricta* is the species cultivated in the latter; it is not an article of general culture, but only in garden villages, near and below the Gháts, where soil is alluvial, and stream water abundant.

The young plants are raised in a bed formed by ash manure; on the ground being thoroughly moistened, which it ought to be by the 10th July, the young plants are taken out and puddled down in the adjacent fields previously prepared by a light plough and harrow. The increase of this grain is very great, in good soil about three thousand pounds per acre; it is a cheap grain; its price may be quoted at from one hundred and fifty to one hundred and ninety pounds per rupee. I believe that the Banyans often refuse it as a return for cash borrowed, a proof of the small value attached to it in proportion to its bulk.

The hill species, *E. coracana*, is a smaller plant and much less productive; it is planted out in July. As the mode of its cultivation is identical with that pursued with the other hill grains (one excepted,) one description may serve for all.

A piece of jungle is cleared of bushes or trees in any of the dry months; the bushes, leaves, and wood, are thickly spread so as to cover the ground intended for the plants; fire is applied in April or May; with the first rainfall seed is sown broadcast. When the plants are sufficiently high, advantage is taken of wet weather to scratch the adjoining ground into furrows, either by hand or a light plough, a person follows in the furrows with a basket of the plants, which are simply dropped in, and left to be brought on by the rain acting on the loose soil. No farther care is required, and reaping takes place in October or November.

On account of the broken nature of the ground it is impossible to estimate accurately the quantity of grain obtained from a given portion of soil, but it is certainly less by three-quarters than that obtained from the garden species above alluded to.

Land thus treated is cultivated for four years in the following rotation.

1st. *Eleusine Cor.*, Natcheny.
2nd. Wari, or Kang, (Kangni?) *Panicum Miliare*, and *P. Italicum.*
3rd. Harík, Kodroo, (Kadrava,) *Paspalum scrobiculatum.*
4th. Verbesina, Black Til, an oil plant.

These four crops are considered to exhaust the soil, which is left in fallow for twelve years. The straw of Natcheny is indispensable to the Ghát peasant and the Concan cultivator, as a food for their cattle. In those countries the grass, either from the nature of the climate, or the late period at which it is cut, contains little or no nutriment, and cattle fed on it could not labour for any time. The sale of the spare straw is one of the resources of the peasant, and it is largely purchased by the Lingayet and other travelling grain dealers, whose cattle are generally in good condition. The Banjaras again, or Lumans, make no provision of the kind for their cattle, and the consequence is, that of those who come down for salt late in the season immense numbers die.

The straw of the *E. natcheny* is also used for burning bricks when it is intended that these should be large, or of choice quality; it is chopped up and mixed with the brick clay; the effect, of course, is the thorough baking of the brick. The large bricks to be met with in all old buildings of the Mussulman princes of India have been prepared in this way, so that the children of Israel had reason for grumbling in that they were compelled by Pharaoh to make bricks without straw. (*Vide* Exod. c. v.).

As the roots are many, the grain is thrown on embankments in order that the plant, as it grows, may bind together the earth and stones.

OTHER HILL CEREALIA.—Of these, it may be said generally, that the mode of cultivation is as in that last described; that the produce is quite as cheap or cheaper, and is seldom used as food beyond the districts where it is produced. The patch of rice is chiefly looked to as a mean of paying the land-tax, and the cultivator is fortunate if he has a sufficiency of the other grains to last until the following October.

I remark, that this season locusts appear to have alighted only in villages close to the Gháts, or in the Gháts, and in many of these the crops have been so completely eaten up, that the villagers have already begun to feed on the stems of the wild plantain-tree, the wild yam, and the more delicate but rarer root of an undescribed umbelliferous plant named "Peenda."

Before concluding, I will advert to the remarkable intoxicating property found in one of these grains, Harík, a *Paspalum* (frumentaceum?) I have had occasion to see a large number of inhabitants of a village simultaneously affected with intoxication, after a meal made from cakes of this flour. Vertigo, a degree of sleepiness and fatuity, rather than active excitement, is the characteristic effect of this grain. The symptoms are sometimes of a character more severe, lasting for seven days and attended with a vomiting of blood; fatal cases it is said sometimes happen, but I have not any case well authenticated; the effect from the grain eaten is not constant. It is most apt to occur when the grain has attained full development owing to late and heavy rain, acting on a highly manured soil.

Its intoxicating property is said to be neutralised by previous steeping in water wherein cow dung has been diffused.

The remedies had recourse to after the effects have taken place are,

1st, A pottage composed of the flour of "Borud," (*Phaseolus mungo*); and 2nd, expressed juice of leaves of "Harsinga," (*Nyctanthes arbor tristis*).

The action of this grain on the human system is well worthy further investigation.

ART. IV.—*A Letter to* RICHARD CLARKE, ESQ., *Honorary Secretary to the Royal Asiatic Society, on the Oriental MSS. in the Library of Eton College.*

[*Read* 16*th March*, 1844.]

MY DEAR SIR,

AT the close of last season you did me the favour to communicate to me a letter from a member of this Society, Major Postans, alluding to the Oriental MSS. in the Library of Eton College. That collection had occupied my attention some time before, having during the last three or four years, on occasional visits to the College, examined the MSS. very minutely, for the purpose of making their existence better known than it appears to be. With the exception of the late lamented Sir W. Ouseley, and Professor Lee of Cambridge, they seem to have entirely escaped the inspection of Orientalists.

The history of the collection is curious and interesting. Above fifty years ago, Mr. E. Pote, a Scholar on the Foundation of Eton College, having subsequently completed his studies at the sister institution, King's College, Cambridge, and entered on public life in India, collected in that country between four and five hundred MSS., chiefly Persian and Arabic, as the most appropriate offering he could make to the two royal foundations to which he was grateful for his earlier education and preferment. The gift was announced by a letter from Mr. Pote, from Patna, Feb. 1788, explaining its object, and arrived in England in 1790, when, in compliance with the donor's wishes, the books were divided between the Colleges of Eton and King's, and deposited in their respective libraries. A catalogue, prepared in India, was to have accompanied the collection, but was not received till four years after. It will readily be conceived by those conversant with Eastern bibliography that the description it contains would be far from satisfactory in the present more advanced stage of science. The kind friends to whom I am indebted for the greatest indulgence in visiting the College Library, have promised me a copy of this catalogue, from which, with the numerous notes I have taken of the MSS. themselves, I hope to be able to arrange a list, if not entirely satisfactory, at least more available for reference and research. In the mean time, the following hasty sketch of its contents may perhaps be worthy the notice of lovers of that literature.

The portion of the Pote Collection appropriated to Eton College contains 222 volumes. The department of history in which it is most rich, relates chiefly to the country in which the collection was formed.

It comprehends the valuable history the Bóstáni Khayál; a Táríkh Kashmírí by Haider Ibn Hasan Mulk; the Ayíni Akbari; the Táríkh Shah Shujái, or History of the Four Sons of Shah Jehan; and the Histories of Baber, Akber, Jehangir, 'Alamgír, Ferruksír, and Muhammed Shah, which bear their names. Merely in reference to our recent success in India I may mention also a copy of the Gwalior Nameh, an account of the capture of that fortress in 1780.

In General History there are the Majmua al Tawarikh; the Labb al Tawarikh; the Mukhtasar al Tawarikh, by 'Abdasselám; the Tarikh Bedawani; the Compendium called Muntakhab al Tawarikh; and a History called Kutub al Tawarikh, terminating with the reign of Shah Tahmasp; while the Aalam Arái, Tarikh Nádiri, and Zafar Nameh (a valuable copy made at Herat, 877), illustrate the reigns and conquests of Timur, Shah Abbas, and Nadir Shah. I must particularly notice a beautiful copy of the Matla as'saadín, in 2 vols., (written 993), the Tarikh Elfi, or Chronicle of the first 1000 years of the Hijrah, and another History of Abbas the Great, styled the Abbas Nameh, which I do not remember to have seen elsewhere. To the historical series may be appended a few works on Biography, Geography, and Historical Geography; as, the valuable Heft Aklím, the Nigaristan of Ghaffári, and the MS. of the Mesálik u Memalík used by Sir W. Ouseley in his edition of Ibn Haukal. In Lexicography there is the Kámús, one of the most exquisite copies I have ever seen; the Sahháh, a magnificently written large folio, pointed throughout; the Dictionaries, Kashf al Loghát, (from the library of Sultan Ahmed ben Masoul); the Kunz al Loghát, Maadan al Loghát, Lutayif al Loghát, and Gheráyib al Loghát; the Ferhengi Rashidi, and a Ferhengi Akhláki Násiri specially devoted to the difficulties of that ethical work. Nor is the collection deficient in Theology, Ecclesiastical History, Jurisprudence, and Tradition, which form so large a proportion of the contents of most Muhammedan libraries. Accordingly, we have several Korans, with numerous Commentaries, including that of Baidháwi; the curious work Fusús al Hukama; a beautiful MS. of the Mirát al Kadas, or Tarikh Hezrati Isa; the Majmua al Bahrein by Dara Shikoh; the Rawzat al Ahbáb, a noble folio in beautiful Naskhi; fine old copies of the Maárij la Nebúwwat, of the Mishkáti Sherif and the Sharhi Mishkát, with the voluminous compilations of Decisions collected under the titles of Awrádi Imamíyah, Fatawái Alamgiri, and Fatawái Firozsháhi. Among the philosophical and scientific works, besides several medical books, there is the valuable Encyclopedia, Nefáyis al Funún; and there is a Persian Commentary on the 'Milal wa'l Nahal' of Shahrestáni, now edited by the Text Society.—The Poetical works are not numerous.

There is, however, a splendid Shah Nameh (in 2 vols.), formerly belonging to Col. Polier, of which there is another copy, apparently not of the Pote collection; and there are duplicates of the well-known paraphrase Shamshír Kháni, besides a Mesnawi Mánawi of great beauty and value. Also the Makhzan al Asrar of Nizami; Jami's Yusuf and Zulaikha, Hatifi's Laili and Mejnun, and a poem of Mahmud u Ayáz; the Mystical poems of the Mantak al Tayr, and the Gulshani Ráz; the Karán as'saadein of Amir Khusru of Dehli, and his Khamsah; and the entire works of Shaikh Ali Hazín. The few Hindustani MSS. the collection contains are chiefly in this class, comprising the 'Story of Madhu Null;' Kamrup, (of which there is also the Persian version;) and Sawda's Kulliát,—a very beautiful copy. There is also the Persian Nal u Damna, and a full set of a Persian translation of the Mahabharata.

Some of the MSS. of small Persian poems are of beautiful penmanship and ornament, but the gem of the collection is an exquisite little Ajáyib al Makhlúkát, in verse, of which the original work in Arabic, and the usual Persian version of Kazwini should have been mentioned before, and are all three embellished with miniature paintings. A Sanskrit work, highly ornamented, forms also one of the show pieces of the Library; I believe it is the Siva Purána.

The usual lighter works of Arabic and Persian literature have also a place here; the Gulistan and Bostan, beautifully written; Hatim Tái; Lutayif al Zaráyif (stories); Túti Namah; the Makámát ul Hariri, with a commentary; and the usual sprinkling of Risalahs on Music, Grammar, Cookery, and Farriery, which is incidental to a miscellanous collection. I may conclude in the words of that accomplished Persian scholar, Major Charles Stewart, who in the postscript to his 'Descriptive Catalogue of Tippoo Sultan's Library,' says:—

"Were the Oriental Manuscripts, dispersed through England, either generally known, or assembled in one place, Britons need not travel far to prosecute their Oriental studies."

Believe me to be,
My dear Sir,
Very faithfully yours,
N. Bland.

Randall's Park, March, 1844.

Art. V.—*Abstract of a Discourse, by* Dr. Falconer, *on the Fossil Fauna of the Sewalik Hills.*

Two evening meetings of the Royal Asiatic Society were held at the Society's Rooms, in Grafton-Street, on the 1st and 8th of June, when Dr. Hugh Falconer gave a discourse, in two lectures, on the ancient animal races of India, as indicated by the Fossil Fauna of the Sewalik hills. The first meeting was occupied with a general description of the Sewalik fossil animals. Dr. Falconer referred to the antiquity of the human race in India, and the spreading of its mythology, arts, and sciences, over other nations: they had extended to Greece and Italy through Egypt. There is a limit to antiquarian research, at the point where we cease to have indications of the human race. If we desire to dive further into antiquity, we have to fall back on the monuments and inscriptions constructed by nature, on the fossil remains of the extinct races of animals which formerly peopled the earth. Some of the Sewalik fossils appear to afford grounds for entertaining the presumption that it may be possible to connect the human epoch with very remote times. The *Colossochelys Atlas*, or gigantic fossil tortoise of India, discovered by Captain Cautley and Dr. Falconer, supplies a fit representative of the tortoise which sustained the elephant and the infant world in the fables of the Pythagorean and Hindu cosmogonics. It is a point of great interest to trace back to a probable source, a matter of belief like this, so widely connected with the speculations of an early period of the human race. Dr. Falconer gave a brief historical account of the discovery of fossil remains of extinct mammalia in India, commencing with the incident mentioned in Ferishta's history, during the reign of Feroz Toghlukí, A D. 1360; the discoveries of Captain Webb and Mr. Henry Colebrooke, in the elevated plain of Tibet; the Irrawaddi remains met with by Mr. Crawford, and described by Mr. Clift; the Sewalik fossils discovered by Captain Cautley and Dr. Falconer, Captains Baker and Durand, and Colonel Colvin; the Nerbudda fossils, by Dr. Spilsbury; the Gulf of Cambay fossils, by Dr. Lush and Lieutenant Fitzjames; and the Jumna fossils, by Serjeant Dean. Dr. Falconer then briefly described and exhibited specimens of the most remarkable fossil species. There were no less than five extinct species of mastodon and elephant; viz.: the *Mastodon latidens*, (Clift); *M. Elephantoides*, (Clift); *M. Sivalensis*, (Falc. and Caut.); *Elephas quadrifrons*, (F. and C.); and *E. Hysudrensis*, (C. and

F.): the Sewalik fossils showing that these so-called genera are undistinguishable through any characters derived from the form and structure of the teeth. Then followed the fossil species of Rhinoceros, the Hexaprotodon hippopotami, Merycopotamus, (Caut. and Falc.) a remarkable new genus; Anoplotherium Sivalense; several species of Sus, and three species of the genus Equus. There were nearly as many fossil species of mastodon and elephant, as there are now species of the whole order of Pachydermata upon the continent of India. The fossil Ruminants were then described. They were surprisingly rich, including almost every type, fossil or recent, known in the order; viz., two species of Giraffe, *Camelopardalis Sivalensis*, (Falc. and Caut.), and *C. affinis*, (C. and F.); species of Camel, Deer, Antelope, Musk, *Bos*, *Bubalus*, *Bison*, in a great variety of forms, and the colossal ruminant, *Sivatherium giganteum*, (C. and F.), bearing four horns, and nearly approaching the elephant in size. The Sivatherium was illustrated with a full-sized restored diagram of the head.

The Carnivora were described as comprehending fossil species of Felis, Hyena, Canis, Mustelidæ, Machairodus, and the new forms of Hyænarctos, and Enhydriodon (F. and C.) There were several fossil species of Quadrumana, and forms of Rodentia and Insectivora. The Sewalik Reptilia were exceedingly rich in forms, particularly of the Crocodiles and Chelonians, some of which were undistinguishable from existing species; while the *Colossochelys Atlas* tortoise is a prodigy of size in the order. It was in every part of its organization a true land tortoise; estimated from numerous remains, to have had a shell twelve feet long, and six feet high. This colossal reptile has lately been described in a communication to the Zoological Society; and was illustrated by an excellent restored diagram of the inferred natural size, by Mr. Scharf, eighteen feet long. Dr. Falconer speculated on the possible connexion of this fossil form with the gigantic tortoise which figures so prominently in the Pythagorean and Hindu cosmogonies.

In his second lecture, on the 8th instant, Dr. Falconer gave the general conclusions drawn from the Sewalik Fossil Fauna, and its bearings on the climate, geography, and geological changes of ancient India. The first prominent character was the wonderful variety of forms. It seemed as if all the geographical divisions of the old continent, and every geological epoch from the older tertiaries down to the modern, had contributed representatives to form one comprehensive fauna in ancient India. Monkeys, Camels, Giraffes, &c., were mixed up with Anoplotherium, Sivatherium, &c. All the mammiferous remains which had been gone fully into, belonged to extinct species; while some, in regard to which the evidence was incomplete, came very near to existing species, and might ultimately prove to be identical with them. Some of the reptilian forms appeared to be identical with existing forms. The Sewalik Fauna was remarkable for a general peculiarity of type, and for the number of transitionary forms contained in it. Half of it exhibits a parallel representation of the existing Fauna of India, and the remainder represented the forms met with in the older tertiaries. It contained, so far as the inquiries had yet gone, no species of the Marsupial, Edentate, or Cetaceous orders. The abundance of the remains in the Sewalik strata was indicated by the immense extent of the collections. That which Captain Cautley had munificently presented to the British Museum, amounted to about two hundred chests, averaging about four hundredweight of contents each, while other collections, nearly equal in extent, were formed by Captains Baker and Durand, Dr. Falconer, Colonel Colvin, and others.

Dr. Falconer then gave the geological and climatal bearings of the question. The continent of India, at an early period of the tertiary epoch, appears to have been a large island, situated in a bight formed by the Himalayas and Hindoo Koosh ranges. The valleys of the Ganges and Indus formed a long estuary straight into which the drainage of the Himalayas poured its silt and alluvium. An upheavement took place, which converted these straits into the plains of India, connecting them with the ancient island, and forming the existing continent. The Sewalik Fauna then spread over the continent, from the Irrawaddi to the mouths of the Indus, two thousand miles; and, northwest, to the Jhelum, fifteen hundred miles. After a long interval of repose, another great upheavement followed, which threw up a strip of the plains of India forming the Sewalik Hills, and increased the elevation of the Himalayas by many thousand feet. This event, and the climatal changes which it involved, caused the extinction of the Tibetan and Sewalik Faunas. Dr. Falconer then discussed the climatal conditions of the case, and the changes implicated in these upheavements. He inferred that India is now enjoying "the summer of the great cycle;" that, in contrast with what has taken place in Europe, there has been no decrease of temperature in that country, which has now as warm a climate, if not warmer, than it ever had, during any part of the tertiary period. He endeavoured to show that the Sewalik Fauna may have lived through a period equal to that occupied by several divisions of the tertiary epoch in Europe. A great addition to the height of the Himalayas was inferred to have been made at a very late period.

At the conclusion of the lecture, **Charles Lyell**, Esq., at the invitation of the President of the Society, made some remarks on the subject of Dr. Falconer's discoveries. He said he could bear ample testimony to the value of the discoveries made by Dr. Falconer and his coadjutors in India, and expressed his belief that no Government expedition in a distant country had ever done more than they had by their private exertions to enlarge our knowledge of Natural History and Geology, and enrich our national Museum with important treasures. Dr. Falconer and Captain Cautley had been separated from the rest of the scientific world, when prosecuting their investigations, and had no access to large libraries or collections of osteology, while they were determining the specific characters of new fossil animals, and founding new genera, some of which supplied links, as they had pointed out, between widely distant genera, or families previously known. It is therefore highly creditable to their skill and scientific acquirements, that the justness of their views and determinations had since been confirmed by Mr. Owen, and other eminent comparative anatomists in Europe. This collection of organic remains from the Sewalik hills derives a novel and peculiar interest from the circumstance of their affording the first example of a large number of fossil Vertebrata (with very few exceptions of extinct species) procured from a country where the climate may be presumed to be as hot now, as at the period when the fossil animals flourished. The fact of some of these Sub-Himalayan fossil Vertebrata having been ascertained by Dr. Falconer to be identical with species still living in the same region, may perhaps be explained by a considerable similarity of temperature in ancient and modern times. Nevertheless Mr. Lyell conceives that intermediate changes of climate may have been among the most influential causes which exterminated the greater part of the Fossil Fauna of the Sewalik hills, and he suggests that the colder temperature of that comparatively modern era, when erratic blocks were drifted by ice from the poles towards lower latitudes in both hemispheres, may have destroyed numerous species in India.

To determine the relative age of the Sewalik fossils, a more careful comparison of the fossil shells brought home by Dr. Falconer with a larger collection than we yet possess in London of recent Indian species, will be necessary. So far as they have yet been compared a decided majority of the fossils appear to be of extinct or unknown species, and Mr. Lyell would not be surprised if the Sewalik strata should prove to belong to the older Pliocene, or even the Miocene period, in which latter epoch in Europe the Palæotherium lived contemporaneously with the Mastodon, Elephant, Hippopotamus, Dinotherium, Ape, Crocodile, and other recent and extinct genera of mammalia and reptiles, constituting a Fauna in many points analogous, and scarcely less rich or remarkable than that of which the remains have been so successfully investigated by Dr. Falconer and others in India. Mr. Lyell concluded by expressing a hope that the results of these elaborate researches would speedily be made known to the public, and that the Government and East India Company would contribute funds towards the Osteological and other necessary illustrations.

The MARQUIS of NORTHAMPTON begged to say a few words on the important nature of the discoveries which had just been laid before them, in addition to the able observations of Mr. Lyell. It was fortunate, he said, that these discoveries were made in a region which formed a portion of a civilized empire, so that they might not be lost as soon as found, but communicated to the world. The situation of our country—"penitus toto orbe divisa"—made it more incumbent upon us as a nation to publish the results of our scientific enterprises: we were less accessible than the other countries of Europe; and although at this moment we were honoured by the presence of an Emperor and a King on our shores, such visits were necessarily few and far between. He thought that the publication of such extensive investigations and important discoveries, as those of Captain Cautley and Dr. Falconer, in geology, should be matter of national concern; and, as President of the Royal Society, and one of the trustees of the British Museum, he felt it incumbent upon him to express his opinion, that the learned Societies of England should unite to call upon the Government of the country to afford means for so doing; and he had little doubt that the call would be successful. He would not sit down without expressing his sincere thanks to Dr. Falconer, for the intellectual treat he had afforded his hearers.

LORD AUCKLAND concurred fully with the noble Marquis; and said that the Royal Asiatic Society would be most happy to co-operate with the Royal Society, or with any other institution, in furthering so valuable an enterprise.

Art. VI.—*On the Identification of the Mustard Tree of Scripture; by* J. Forbes Royle, M.D., F.R.S., L.S. *and* G.S., &c., *Professor of Materia Medica and Therapeutics, King's College, London.*

[*Read March* 16, 1844.]

Numerous attempts have at different times been made by a variety of authors to identify the two plants which in the authorised version of the Scriptures are translated *Mustard Tree* and *Hyssop*. That these attempts have not been so satisfactory to others, as to set the questions at rest, is evident from fresh plants being continually adduced, even in recent works, as possessed of the requisite characteristics It may be inferred that those do not appear, to the author of this paper, to have been more successful than preceding endeavours, from his making a fresh, and which to many will appear a presumptuous attempt to determine what has baffled so many able inquirers. Few fields, however, are so barren, even after they seem to have been cleared by the most skilful reapers, as not to yield some grains to the careful gleaner. So, continued attention to any one pursuit, never fails to throw light, not only on itself, but also on other, and what at first appear but remotely connected subjects. Thus it has been in the study of *ancient* for the purpose of elucidating *modern Materia Medica*, and of both in connexion with the Botany of the East, that the author has been led to conclusions, which seem to elucidate some of the disputed points in Biblical botany.

As this may require explanation, I may here mention, as I have already related[1], that my attention was first directed to the identification of the natural products mentioned in ancient authors, in consequence of having, in 1825, while in medical charge of the station of Saharunpore, and of the Honourable East India Company's Botanic Garden there, been requested by the Medical Board of Bengal to investigate the medicinal plants and drugs of India. This was for the purpose of ascertaining how far the public service might be supplied with medicines grown in India, instead of their being nearly all imported from foreign countries. In endeavouring to effect this important object, my attention was in the first place directed to making myself acquainted with the different drugs which the natives of India are themselves in the habit of employing as medicines. For this purpose I found it absolutely necessary to examine the things themselves, as well as to ascertain the names by which they were commonly known. I soon found that in this inquiry, it was necessary to become acquainted with the written works in the possession of the natives of India, as well as with their personal and traditional information. I therefore caused the works on Materia Medica to be collated by competent Hakíms and Moonshees, among whom I would mention, as my principal assistants, Sheikh Nam Dar, commonly called Nanoo, the head medical assistant in the Civil Hospital of Saharunpore, and Murdan Aly, the chief plant collector, and keeper of the Herbarium in the Saharunpore Botanic Garden. By them the arrangement of these works, according to the Arabic alphabet, was persevered in; but the substances mentioned in each were arranged under the three heads of the Animal, the Vegetable, and Mineral Kingdoms. The works which were collated[1] extend from A.D. 1392 to 1769, the first having been written shortly after the close of the classic age of the School of Bagdad, the authors of which the Persian writers constantly follow. Al Buetar or Ibn Buetar, frequently quoted by Bochart in his Geographia Sacra, is the last of the distinguished Arabs. He died in 1248; the first translations into Arabic from the Greek and Sanskrit having been made about A.D. 748, or just five hundred years before the death of Ibn Buetar, during the Kaliphat of Al-Mansur. During this period lived Haly Abbas, Mesue, Serapion, Rhazes, and Avicenna.

---

[1] Proceedings of the Royal Asiatic Society, 19th March, 1836.

These were themselves indebted for much of their information respecting drugs, to Dioscorides. But to his description the Persians have fortunately appended the Asiatic synonymes, and have given some account of Indian products not mentioned in the works of the Arabs. I myself made a catalogue (still in manuscript) of the whole, in which, after the most usually received, that is, the Arabic names, I inserted the several synonymes in Persian and Hindee, as well as in metamorphosed Greek. I obtained the articles, and traced them to the countries whence they were said to be derived, as well as to the animals and plants which were said to produce them; and made notes of any remarkable characteristics, and the medical uses to which they were applied.

---

[1] Ikhtiarat Buddee, who completed his work in 770 of the Hejira, or A.D. 1392. He is said to be the first who wrote on Medicine in the Persian language.

Tohfet-al-Moomineen, written in A.D. 1669, by Meer Mohummud Moomin; a native of Tinkaboon, in Dailim, near the southern shores of the Caspian Sea.

Ulfaz Udwiyeh, compiled by the physician of the Emperor Shah Jehan; translated into English, by Mr. Gladwin, and printed in 1793. This is useful, as giving the synonymes in Arabic, Persian, and Hindooee, in the Persian character.

Mukhzun-al-Udwiyeh, or Storehouse of Medicines, written A.D. 1769, and printed at Hoogly, in 1824.

The Taleef Shereef, translated from the Persian by Superintending Surgeon Playfair, and published in Calcutta in 1833, has been referred to in a few instances.

Since my return to this country in 1832, having obtained copies of the Latin editions of Mesue, Serapion, Rhazes, and Avicenna, I have in many instances collated them with my manuscript catalogue.

Being without any suitable library for such investigations, and able only to obtain a small copy of Dioscorides, (12mo, Parisiis, 1549,) I was in most cases obliged to depend upon myself, for the identification of the several substances. The results of many of these investigations are briefly recorded in the observations on the history and uses of the different natural families of plants in my Illustrations of the Botany, &c., of the Himalayan Mountains. I also made use of these materials in my Essay on the Antiquity of Hindoo Medicine, in tracing different Indian products from the works of the Arabs into those of the Greeks, even up to the time of Hippocrates. I inferred that tropical products could only travel from South to North; and that the Hindoos must have ascertained their properties, and used them as medicines, before they became sufficiently famous to be observed and recorded by the Greeks. Having thus traced many of these Eastern products to the works of almost contemporary authors, I was led to conclude, that many of them must be the same as those mentioned in the Bible, especially as there is often considerable resemblance between the Arabic and Hebrew names; as, for instance:—

HEB.	ARAB.	
Abattachim	Buteekh	Melons and Water-Melon
Adashim	Adas	Lentils
Butzal	Butzl	Onions
Botnim	Butum	Pistacio Nut
Cammun	Kumoon	Cumin
Carcom	Kurkoom	Saffron

Some, again, would appear to have an Indian origin; as, for instance, Ahalim, translated Aloes wood, which is, with very little doubt, the same as the Malayan Agila, or Eagle wood, famed in ancient as in modern times. So Karpus, occurring in Esther I. 6., is translated *green* in the English Bible; but being placed between the words which signify the colours white and blue, it would naturally appear to be the thing coloured, which was, no doubt, cotton, Karpas, from the Sanskrit Karpasa, now in Hindee Karpas and Kapas. And, it is further said, in the description of the court of the garden of the King's palace at Susa, that these white and blue hangings were fastened with cords of fine linen and purple to silver rings and pillars of marble. Of this we have a vivid representation in what may every day be seen in India, especially in the Hall of Audience at Delhi, where huge padded curtains, called Purdahs, (and usually in stripes of white and red, or blue and white,) may be seen suspended from the tops of slender pillars. For this purpose, indeed, the rows of pillars in front of the principal ruins of Persepolis appear to have been intended.

While residing in, and becoming acquainted with the manners of the East, I have often, in reading the Scriptures, been struck with the brevity and force with which the sacred penmen, in describing what was then before them, give a graphic picture of the living manners of the day. In the absence of medals, monuments, and inscriptions, and where the mouldered ruins of mighty cities allow us with difficulty to trace out even their sites, we are presented with the astonishing spectacle, that manners, which in Europe are fleeting and changeable as the wind, in the East, give living representations of those which characterised the residents of the very same regions, more than three thousand years ago. So conspicuously is this the case, that works have been written describing the manners, customs, and other characteristics of the East, for the express purpose of elucidating obscure passages in the Scriptures, as Roberts' Oriental Illustrations of the sacred Scriptures. Some again, as Dr. Taylor, in his Illustrations of the Bible from the Monuments of Egypt, and Athenæum, Nos. 507, 508, and 509, have had recourse to the works of Rosselini, Champollion, Wilkinson, and others, on Egyptian antiquities, as revealing most minute particulars of the public and private life of the Egyptians, and thus affording "important because undesigned confirmations of the historical veracity of the Old Testament."

It is hardly necessary to mention how the geography of Palestine, and the other countries which were the scenes of the transactions described in Scripture, has in like manner, and from the earliest times, been minutely examined for the purpose of illustrating the Scriptures. And yet even in this department, from the more careful researches, assisted by the knowledge of Arabic, of Mr. Eli Smith, unexpected discoveries have been made by Messrs. Robinson and Smith, in their most interesting and instructive travels. On this subject, these travellers observe, "There is in Palestine another kind of tradition, with which the monasteries have had nothing to do, and of which they have apparently in every age, known little or nothing: I mean, the preservation of the ancient names of places among the common people. The Hebrew names of places continued current in their Aramæan form long after the times of the New Testament; and maintained themselves in the mouths of the common people in spite of the efforts made by Greeks and Romans to supplant them by others derived from their own tongues. After the Muhammedan Conquest, when the Aramæan language gradually gave place to the kindred Arabic, the proper names of places, which the Greeks could never bend to their orthography, found here a ready entrance, and have thus lived on, upon the lips of the Arabs, whether Christian or Muslim, townsmen or Bedouins, even unto our own day, almost in the same form in which they have also been transmitted to us in the Hebrew Scriptures." Travels, I., p. 375.

I myself have long been of opinion that if similar pains were bestowed on the material substances mentioned in the Bible, and equal trouble taken to ascertain the natural history of the countries where the several events are described as having taken place, or with which there was commercial communication, much light would be thrown upon the sacred writings. For the products of nature, whether minerals, plants, or animals, are similar in nature and properties to what they were when man first made use of, or became acquainted with them. As those only which were most remarkable in appearances or properties would usually be cited, so many of those named in the Bible might be successfully ascertained, and afford most convincing proofs of books having been written at the times, and in the places to which they are usually ascribed. In this inquiry, as in that of the names of places, we have not only the traditional names of animals, plants, and minerals to assist us, but also those which are registered in the Arabic works on Materia Medica; as in these most of the useful substances of antiquity are described. Thus the cedar continues to be called *Erez;* lentils, *Adus;* the broom, translated juniper, is still known by the name *Retham:* and many others might be adduced.

Considerable success has no doubt attended several of the attempts of naturalists to identify the natural history of the Bible. Confining our attention on the present occasion to plants only, we have Olaus Celsius, a friend of Linnæus, who did for the plants of the Bible what Bochart had done for the animals, and quite as well. He gave the labour of fifty years to the elucidation of the plants of the Bible; and seems to have exhausted the learning of the subject, as far as illustrations from Greek and Roman writers, as well as from the works of the Jews, and of many Arabic authors are concerned. He also travelled in the East, and being acquainted with botany, first gave precision to our knowledge. Hence many of his determinations of the plants of the Bible remain undisputed. Other plants have been determined by the few naturalists who have visited the Holy Land for the purpose of identifying those of the Bible. Belon, who travelled in the East for three years (1546—1549), has given considerable attention to the plants and animals of the Bible, in his "Observations sur Plusieurs Singularités et Choses Mémorables trouvées en Grèce, Asie, Judée, Egypte, Arabie, et autres Pays Etrangers: Paris, 1588." Rauwolf, in the same century (1576—1579), travelled in Palestine, Syria, and Mesopotamia; and made it his especial business to make himself acquainted with the plants of those regions. His travels were translated into English under the auspices of Ray, and thus frequently escape notice, as the two volumes are usually called Ray's Travels. These have the advantage of valuable catalogues prepared by Ray, of the plants found in the East by Belon, Rauwolf, and others. Rauwolf's own plants were published in the Flora Orientalis of Gronovius; Leyden, 1755. Hasselquist, an enthusiastic pupil of Linnæus, travelled in the Holy Land for the express purpose of examining the plants of the Bible. He died at Smyrna in 1752. His papers were published by Linnæus himself, and a translation into English in 1766, and the Flora Palestina in Linnæi Opuscula. Besides these, Labillardière, Bové, Aucher-Eloy, and other travellers, have made us acquainted with many of the plants of Palestine. But we are still without a complete Flora of the Holy Land. Russel has given a list of the plants of Aleppo; and Forskal, Delisle, and others, of many of those of Egypt and Arabia.

Notwithstanding the exertions of these several naturalists, many of the plants of the Bible still remain undetermined, and by some commentators, nothing is considered so uncertain, as the determinations which have already been arrived at. Though each of the above authors has ascertained some plants, or confirmed the determinations of others, the success has yet not been so complete, as might have been expected from the exertions which have been made. I am not aware of any modern botanist having applied himself to the study of the Flora of Palestine, for the purpose of elucidating the natural history of the Bible.

The difficulties of identifying objects known to the ancients are no doubt considerable, as a knowledge is required, not only of Natural History, but also of some of the vernacular languages, to hold converse in, with the natives, and consult the works in which the useful plants or products may be described. We are besides without the proper means for making satisfactory investigations. We do not yet possess a detailed Flora of Palestine, with the native names, properties, and uses of the several plants, and the situations in which they are found. With a simple Flora only, we should be at a loss among some thousand plants, to determine upon the hundred or so which are mentioned in the Bible. The properties which any particular plants possess, or the uses to which they are applied, necessarily restrict the attention to a smaller number, while the present native name might in some cases, from its similarity to the Hebrew, lead us to an identification, which we should have been at a loss for, without this assistance. But even this is not sufficient, for we shall find that though some of the vernacular names are somewhat similar to the ancient Hebrew, yet this is not the case with many others. Yet these plants may have names in some of the cognate languages, which are so similar to the Hebrew, as to leave no reasonable doubt of their original identity. Even some of the Greek and Latin names are not so dissimilar, but that we may often suspect that they indicate the same thing. Many however of the substances mentioned in the Bible were the produce of commerce, and obtained from distant countries. For these, a knowledge of the natural history and languages of Syria and Palestine are without value. We must follow the routes of commerce, and trace them to the countries whence they are said to have been obtained. We shall find in many instances that similar substances continue to be produced in those countries, are still objects of commerce, and continue to be used for the same purposes, and in some cases, present us even with so great a similarity in name, as to give us every reasonable assurance, that we clearly identify in the present product, the ancient article of commerce.

It was in identifying some of these articles of ancient commerce, said to be the products of India, that my attention was first directed to the subject. In following Indian products with Indian names, from India to Greece, as mentioned and described in the works of the Greeks, I inferred, as I have already stated, that their properties must have been investigated, and the substances made use of by the natives of India, before they could become known to distant nations, and become articles of foreign commerce. Hence I conceived myself entitled to infer the antiquity to a certain degree, of medicine among the Hindoos (*v.* Essay on the Antiquity of Hindoo Medicine). In the course of these inquiries I perceived that the same course of investigation could be usefully pursued, for ascertaining some of the substances mentioned in the Bible; in fact, many of them appeared to be the very same substances as those mentioned by the Greeks.

The works of nature through all ages retain uniformity of structure and of properties. Those most conspicuous for such as were useful or agreeable, would be the first to be employed in early times. By these properties, and by the names in the vernacular languages, which also retain a surprising degree of uniformity to their ancient forms, we are led to considerable certainty in our results. We must, however, examine the history of the several substances in the only works which contain any detailed or special notice respecting them, that is, in those of Materia Medica, or the Accounts of Drugs. Among these in ancient times, as in the present day among Oriental nations, we shall find, that almost everything is mentioned which has any property either useful or agreeable. With this study we must conjoin a knowledge of the Natural History, or the Mineralogy, Botany, and Zoology of the countries whence the substances were obtained. We shall thus attain a degree of certainty in our results, which to many will appear surprising, and which will give a degree of precision and correctness in our inferences and conclusions, respecting the commerce and intercourse among ancient nations, of which the subject, from its remoteness and dearth of facts, did not seem to be susceptible.

In prosecuting such researches, it is, I conceive, in the first place, necessary to determine the principles upon which they should be conducted, and also, what kind of evidence we should consider satisfactory, as determining that any particular points had been made out. Some of these points may appear too obvious to require being insisted on; nevertheless they have been entirely neglected in some investigations on these and similar subjects.

Confining ourselves at present to Biblical plants only, it is essential that any plant adduced, should correspond in properties, with that, it is supposed to be. 1st. It ought to be found in the countries where it is described, or to which allusion is made. 2ndly. It should possess the properties, or yield the products ascribed to it by the sacred penmen, or we ought to be able to show that such opinions were, or are still entertained respecting its properties and products. 3rdly. As the above would only amount to probability, in consequence of the numbers of plants growing in the same situation, and often useful for the same purposes, the plant ought to have a name in some of the cognate languages, either ancient or modern, or better if in both, which has some similarity to the Hebrew name. In the same way with an article of commerce, we ought to be able to prove that it is, or was, obtained from the direction, or the countries named or pointed out, and that it has the properties which are ascribed to the ancient drug. We ought also, if possible, to show that it has a name in some of the languages of ancient or modern commerce, which is similar to that employed in the Hebrew or Greek languages, or one of which that employed in these languages, seems to be only a translation.

Taking these principles as my guide, I shall endeavour to keep them closely in view in determining the plant which is translated MUSTARD TREE; and subsequently, I shall treat of HYSSOP in a similar manner.

The Mustard Tree of the New Testament has frequently engaged the attention of commentators. It still continues undetermined, because the common mustard plant is considered not to possess all the requisites; and it is difficult to find a plant in which are combined all the peculiarities of that alluded to in Scripture; that is, one producing a small seed; being sown in a garden; growing into a herb, and then into a large tree, which afforded shade and shelter among its boughs to the fowls of the air. In order to ascertain whether we can find any such plant, it is necessary to examine the passages in which the mustard tree is mentioned, that we may know the characteristics by which it was, and should in the present day, be found to be distinguished.

The mustard tree is first mentioned in one of the parables spoken by our Saviour at the sea-side; Matthew xiii. 31, "The kingdom of heaven is like to a grain of mustard seed, which a man took, and sowed in his field:" (32,) "Which indeed is the least of all seeds; but when it is grown it is the greatest among herbs, and becometh a tree, so that the birds of the air come and lodge in the branches thereof." The same parable is mentioned in Mark iv. 31; and the tree is recorded as shooting out great branches, "so that the fowls of the air may lodge under the shadow of it." And in Luke xiii. 19, The kingdom of God "is like a grain of mustard seed, which a man took, and cast into his garden; and it grew, and waxed a great tree; and the fowls of the air lodged" (κατεσκηνωσιν, built nests, Matthew and Mark, κατασκηνοῦν, make their abode) "in the branches of it." The mustard tree is also mentioned by our Saviour in Matthew xvii. 20, "If ye have faith as a grain of mustard seed," ως κοκκον σιναπεως; an expression used metaphorically among the Jews, and meaning the smallest part; and nearly in the same words in Luke xvii. 6. In the original, the grain of mustard seed is called "κοκκῳ σιναπεως," and described as the smallest of seeds, "μικροτερον μεν εστι παντων τῶν σπερματων," which grows into a δενδρον, or tree; St. Luke says that it becomes a great tree, δενδρον μεγα.

Considerable difficulty has been experienced in elucidating these passages, in consequence of the term λάχανον, usually denoting *garden* *herbs* in opposition to wild plants, being employed to designate the plant which was produced from the κοκκον σιναπεως, the grain of mustard seed. Though distinguished as the smallest of seeds sown in a κηπος, garden or plantation, this grew also not only into a δενδρον, tree, but into a δενδρον μεγα, great tree.

Making all due allowance for the figurative and the Oriental form of expression, it does seem evident that the plant here indicated was *arboreous* in habit; though it certainly may appear contrary to nature that a herb of the garden should ever grow into a tree, in the great branches of which birds would build their nests. Indeed, if we were to take this term literally, most herbaceous plants would be excluded, as few are fit for such a purpose, at the season when birds build their nests. On this it might be observed, that both in Syria and Egypt, the crops being sown in autumn and reaped in spring, the plants might be sufficiently grown for the purpose. But here again we may reply, that their instinct would lead them to select a more secure locality, than a crop which was constantly disturbed by the cultivator and watchmen, and liable to be cut down. It is however quite possible to have a tree, cultivated almost like a herb, as may be seen in the Mulberry cultivation of Bengal, where the object is to have soft and herbaceous leaves, as food for the delicate silk-worm.

Commentators have usually taken it for granted that the common mustard plant, or some nearly allied species, is the plant; and have attempted various modes of explaining what appears to them the several discrepancies in the parable of the Mustard Tree. Sir Thomas Browne says, "If we recollect that the mustard seed, though it be not simply and in itself the smallest of seeds, yet may very well be believed to be the smallest of such as are apt to grow into a ligneous substance, and become a kind of tree." This is probably the proper view to take of the subject, especially as we are informed by Buxtorf, as quoted by Rosenmüller (Botany of the Bible, p. 104), that the later Hebrews used proverbially to compare to a mustard seed, any thing very small and insignificant; and he refers for the proverbial use of the expression *Garghir hachardal,* to Buxtorf's Lex. Chald. Talmud, p. 822. On this, Rosenmüller remarks that, "In a proverbial simile, no literal accuracy or strictness is to be expected, and we ought therefore not to be surprised that the mustard seed is spoken of as being 'smaller than all other seeds,' although it is well known that smaller seeds are to be found."

Most have adopted the idea, that the parable of the common Mustard Seed producing a large tree may be best explained by supposing that this is caused by luxuriant growth in a richer soil and warmer climate. Dr. Clarke, for instance, observes, "Some soils being more luxuriant than others, and the climate much warmer, raise the same plant to a size and perfection far beyond what a poorer soil, or a colder climate, can possibly do." On this I may observe, that it does not by any means follow that plants which are at home and flourish in the soil and climate of Europe, will, when cultivated in a warmer and at the same time drier climate grow more luxuriantly. The majority of them will, on the contrary, wither away or be dwarfed.

In conformity to the foregoing view, Scheuchzer has described and figured (Physica Sacra, Tom. viii., p. 59, Tab. DCLXXXIII) a mustard plant which grows several feet high, with tapering stalk; and which spreads into many branches. The *Sinapis erucoides* of Linnæus, is also adduced as a species attaining considerable size, and having a wood-like structure. Captains Irby and Mangles, in their journey from Bysan to Adjeloun, met with the mustard plant growing wild, as high as their horses' heads.

Mr. Frost, a few years since, published a small pamphlet which obtained considerable attention among literary men, in which he attempted to prove that *Phytolacca dodecandra* was the δενδρον μεγα of the Scripture, and its seed the κοκκον σιναπεως. He asserts that the above plant grows abundantly in Palestine; that it has the smallest seed of any tree; and attains as great, or even greater altitude than any other in that country, of which it is a native. As the only attempt at anything like a proof is, that the North Americans call *P. decandra*, *poke weed*, or wild mustard, this opinion has never received the support of scientific men, because it is not known that the plant adduced has ever been found in Palestine, or even in Asia.

Before proceeding further, it is necessary to determine what are the characteristics of the Mustard Tree of Scripture, and what we must look for, in any plant supposed to be it.

In the first place, it appears to me that it must be what is strictly called a tree, perennial in nature, and woody in texture; and growing to some considerable size. It ought, moreover, among the trees of the forest, to have a small seed, for it does not appear necessary that its seed should be the smallest of all seeds. Nor indeed is it probable that the smallest seed of any tree, or indeed of any garden herb, is the smallest of all seeds. 2ndly. The Sinapis or Mustard Plant of Scripture, if not what is now commonly understood as the mustard plant, or some analogous species of Sinapis, ought to be a tree having similar properties. For we shall find that the ancients often grouped together plants and drugs, not so much from resemblance in external appearance as from the possession of similar properties. Thus the black and white Hellebore, the black and white Bryony, the greater and lesser Centaury, were produced by plants having no external resemblance to each other; but the drugs which they yield have similar medical properties. 3rdly. The plant ought to have a name in the language of the country similar to that, by which the common mustard plant is itself distinguished.

None of the plants hitherto adduced appear to me satisfactorily to meet the difficulties of the subject. Much more to the purpose, though little taken notice of, are the quotations from Talmudical writings, which are, however, disparaged by Rosenmüller and others, because they seem to suppose that the passages alluded to, apply only to the common mustard plant. Thus the Babylon Talmud says, there was left to a man in Schechem, by his father, a mustard tree having three boughs of *chardal*, and one of the number being taken was found to afford nine cabs of mustard; and its wood was sufficient to cover the shed of a potter. So in the Jerusalem Talmud, R. Simeon Ben Chalogta says, "A chardal tree was in my field, which I was wont to climb, as men climb into a fig tree." Instead of animadverting on these passages, as if they were exaggerated statements respecting the common mustard plant, it would have been more philosophical to have inquired whether there was any tree of Palestine to which the above description and name could apply: and also, what was likely to have been the name by which our Saviour spoke of the mustard tree, when addressing in parables the people of Syria in the language of their country.

The language in which our Saviour addressed his parables was no doubt the Hebrew or one of the cognate dialects, as the Syriac or Western Aramaic, which formed the common language of Palestine at that time; and both are so closely allied to the Arabic, that many words are identical in all three. Thus the above *chardal*, in the Hebrew signifying mustard, is no doubt the same word as the Arabic خردل *khardal*, signifying mustard, and mustard seed, throughout the East. But the New Testament having been written in Greek, we have only the Greek *sinapis*, where the Arabic *chardal* may have been spoken. Though this word *chardal* is not found in the Old Testament, a word very similar to it (חרול *charul*,) occurs in no less than three passages, in all of which it is translated *nettles* in the authorised version. Thus in Proverbs xxiv. 30, 31, "I went by the field of the slothful, &c., and, lo, it was all grown over with thorns, and nettles (*charullim*) had covered the face thereof." Again, in Job xxx. 7, it is said, "Among the bushes they brayed: under the nettles (*charullim*) they were gathered together." And, thirdly, in Zephaniah, ii. 9. As translators and commentators have no means of determining what plant is intended, different ones, chiefly of a thorny nature, have been fixed upon by different authors. Nettles have however had the greatest number of suffrages: but we have no proof that *charul* means a nettle, neither does it appear needful that it should; or that a thorny or prickly plant is necessary to complete the sense of the passage. For in the first passage, it only appears that fields which are uncultivated or neglected become covered with weeds; and in the passage of Job, such as, idlers may take shelter in, or take refuge among. The Arabic *khardal*, being evidently the same as the Hebrew *chardal*, and this being very similar to *charul*, I feel disposed to think that it may have the same meaning, or be applicable to one of the kinds of khardal or mustard; and we know that nothing so readily springs up in neglected corn-fields as the *charlock*, *chadlock*, or *kedlock*, as it is called in different parts of this country, and which is the *sinapis arvensis* of botanists. (Art. *Charul*, Cyclop. Bibl. Literature.)

Before proceeding to shew to what plant the term *khardal* appears to be applied in the present day, I may first mention how my own attention was directed to the subject. This was in consequence of being asked, some time last year, by the Right Rev. the Bishop of Lichfield, then Principal of King's College, London, whether I was acquainted with what was supposed to be the Mustard Tree of Scripture. I replied that I was not, as I had paid attention chiefly to those substances which had formed objects of ancient commerce, rather than to the natural products of Palestine; but that I had no doubt that some plant indigenous in that country would be found possessed of the requisite qualities. His Lordship then informed me that Mr. Ameuny, a native of Syria, and student of the College, then attending the theological class, had said, that he was perfectly well acquainted with it. Dr. Lonsdale added, and that his description of the tree seemed to correspond with everything that was required. On seeing Mr. Ameuny, and asking him whether he knew any tree which answered to the Mustard Tree of Scripture, he replied, that he was perfectly well acquainted with one; had often seen it, as it was common in the neighbourhood of Jerusalem; and that it was large enough for a man to stand under on horseback. I asked him what it was called; he replied, that it was everywhere known by the name of *khardal*. I observed, that that is the common Arabic name for mustard. He said, "So it is; and it is also applied to the seeds of this tree, which are universally employed throughout Syria as a substitute for mustard, of which they have exactly the taste and properties."

Mr. Ameuny was unable to give me any further information respecting it.

Previously to this, but without paying any particular attention to the subject, I had conceived that Vitex Agnus Castus might be the Mustard Tree of Scripture, as it grows to the size of a good-sized shrub, with woody stem, and its seeds have sometimes been called *piper agreste.* I also thought that it might be one of the larger Capparideæ, which grow to a considerable size, have berried fruit containing numerous small seeds, and one of which is described by Belon as "Capparis Arabica fructu ovi magnitudine, semine piperis instar acre." The flower-buds and seeds of the caper of Mount Sinai, *capparis sinaica,* are pickled; and the latter are called *filfil-i-jibbul,* mountain pepper. But as there did not appear any proof in favour of any of these, the investigation was not pursued.

Having ascertained that the name *khardal* was in the present day applied to a tree in Palestine, the next point was to ascertain its name and nature, so that it might be seen whether it was in all points answerable to what was required. In referring to the ordinary Arabic dictionaries, and lists of drugs in the Latin editions of Avicenna, Serapion, and Rhazes, *chardal* and *cardel* are given as synonymes of sinapis only. In the Ulfaz Udwiyeh, translated by Mr. Gladwin, three kinds of خردل are mentioned: 1*st,* No. 844, *khirdul;* Hindee, *reiy,* mustard. 2*nd,* No. 784, where *khirdul biree* and *junglee-rie,* translated wild mustard, are given as synonymes of *hirasha roomee;* and the 3*rd* kind, No. 853, is *khirdul farsee.* In my own catalogue of Asiatic Materia Medica, خردل khardal, is given as the synonym of *raee,* that is, mustard. Sinapis juncea, &c. (Decand. Prod. ii. 612.) is the khurdal of Forskal, according to Delisle; and this is clearly allied to sinapis integrifolia, &c. (Decand. ii. 612.) 2. خردل بري *khardal burree,* or *junglee raee,* wild mustard, is the second, though it is difficult to say what plant is intended. 3. *Khardal roomee,* Persian, *hirasha roomee,* translated in Hindee *junglee raee,* or wild mustard, of which the seeds, like those of the former kinds, are described as being stimulant. But neither in this list nor in the previous quoted Ulfaz Udwiyeh, was I able to obtain any information respecting the nature of the plant. But the term *roomee* is by Asiatics usually used in reference to Constantinople, or to the Turkish empire; and I may observe that, the kind called *hirasha farsee,* or Persian mustard, in the Ulfaz Udwiyeh, is called *khardal roomee,* or Turkish mustard, in my notes.

Finding by this investigation that several kinds of khardal, or mustard, were known to Asiatics, and that this name was applied to a tree of Syria, it was extremely desirable to obtain, if possible, its name in scientific works, so that we might ascertain whether it possessed all the characteristics of the mustard tree. For this purpose, among other places, I referred to the index of my Illustrations of Himalayan Botany, where several Arabic names are mentioned, together with the names of the plants to which they are applicable. In this I did not find *khardal,* but a word so similar to it, that I was induced to refer to it, in the body of the work; and was surprised to find that it referred to a tree which, not only in name but in properties, corresponded very closely with what is required for the mustard tree. For instance, under the natural family of Chenopodeæ it is mentioned that, "Salvadora, which is placed in this order by Jussieu, but by Bartling in Myrsineæ, is a genus common to India, Persia, and Arabia; and the same species, *S. persica,* occurs in the Circars, north of India, and the Persian Gulf. Along with this another species is found on the banks of the Jumna, and from Delhi to Saharunpore. This is *S. indica, nob. jāl* of the Hindus, *irak hindee* of Persian authors, who also give this tree the name of *Miswak*, or tooth-brush tree[1]. *S. persica* is called *Khurjál* in North India, *arak* and *irak* in works on Materia Medica. The bark of the root is acrid, and raises blisters. (Roxb.) A decoction of the bark of the stem is considered tonic, and the red berries are said to be edible." Royle, Illust. Bot. Him. Mountains, p. 319.

On referring to the work of Dr. Roxburgh mentioned above, the Flora Indica, vol. i., p. 389, it may be seen that a figure is given of the tree in his Coromandel Plants, vol. i., pl. 26, of which the Telungu name is *Pedda-warago-wenki.* He describes it as a middle-sized tree, a native of most part of the Circars, though by no means common; it seems to grow equally well in every soil; produces flowers and ripe fruit all the year round. This fruit consist of "berries very minute, much smaller than a grain of black pepper; smooth, red juicy, seed one."

Of the properties of the plant Dr. Roxburgh continues to say: "The berries have a strong aromatic smell, and taste much like garden cresses. The bark of the root is remarkably acrid, bruised and applied to the skin, soon raises blisters, for which purpose the natives often use it; as a stimulant, it promises to be a medicine possessed of very considerable powers." Roxb., l. c., p. 390.

---

[1] Can this be the plant to which Burckhardt alludes as the tree of which the Affghans make tooth-brushes on their pilgrimage to Mecca?

This plant was described in 1780 by Retz, in Obs. Bot. iv., p. 24, under the name of *Embelia grossularia*, who stated that he obtained it from König, from Tranquebar. His description agrees in all respects with that of Roxburgh. Colonel Sykes found it in the Dekhan; and it is mentioned in his Manuscript Catalogue, p. 250, as known to the natives by the name of *meru*. In the catalogue of the plants growing in Bombay and its vicinity, *Salvadora persica* is mentioned as growing near the sea in both Concans.

The late Sir A. Burnes, in his voyage up the Indus, mentions *Salvadora persica* (Travels, vol. iii., p. 122) under the name *peeloo*, as met with near Mooltan, and in all the tracts of saline soil that border on the Indus and Punjáb rivers; and especially in the Delta of the Indus, and lower parts of Sinde; and states that its seeds in taste resemble water-cresses, and that he found the fruit exposed for sale in the bazars of Mooltan. He supposes it to be the plant alluded to in Arrian's Indian History, as having leaves resembling those of the laurel, and growing in places within the influence of the sea. But there does not appear to me any proof of this identity. Lieutenant Welsted also mentions it as occurring on the southern coast of Arabia.

Before proceeding further in attempting to identify this tree with the Mustard Tree of Scripture, it is desirable to refer to the original description of this plant, which we find in the Philosophical Transactions, for 1749, p. 491, in a paper written in French, by Laurence Garcin, M.D., F.R.S., of Neufchatel in Switzerland, but translated by Dr. Stack.

This plant is woody. It grows sometimes into a tree, sometimes into a shrub, and sometimes into a bush. Its native countries are the parts adjacent to the Persic Gulf, the North of Arabia, and the South of Persia[1]. It is most commonly found along high roads, and in dry and low places, delighting in the hottest and driest places, more so even than palm trees. Dr. G. had not met with it in Surat or Bengal, where there are regular rainy seasons every year. The inhabitants of the Gulf call this shrub by the name of *Tchuch*. It varies considerably in size; is usually a larger sort of shrub. It produces a number of boughs without order, and very tufted branches, which most commonly hang down to the ground. Its bark is moderately thick, sometimes smooth, sometimes full of cracks, of an ash colour, both in the trunk and branches, but green on the tender shoots. The wood is everywhere brittle, and nearly of a straw colour.

---

[1] Mr. Bennett informs me that there are specimens in the British Museum from Muscat, collected by Aucher-Eloy.

The leaves in shape nearly resemble those of the sea purslain, and sometimes those of the misletoe of the apple tree. They are often covered with excrescences of different sizes and shapes—round, oval, and sometimes very large. They are the work of the flying insects which abound in those parts.

The flowers are disposed in clusters on the tops of the shoots. These bunches of flowers entirely resemble those of the vine blossom.

The pistil or embryo of the fruit afterwards swells in all dimensions, and grows into a berry, in the shape and size of a gooseberry (currant?) of three or four lines in diameter; at first it is of a pale green, then a bright purple, and in its maturity, of a dark red. Each berry is supported on a strong thick pedicle, attached to a small branch. Its substance is white transparent flesh, full of juice, much resembling jelly, which surrounds a single round grain, marbled with black or brown spots, as in the tortoise-shell, when ripe. This grain is as large as a grain of hemp-seed, that is, about two lines in diameter; but sometimes less. It is properly a kernel, or a shell that has a cavity, which incloses a sort of little round almond of a straw colour, yellowish on its outward surface, and pale in its inward substance, which is pretty firm. All the parts of our plant have an acid, pungent taste and smell, vastly like our garden cresses, but more biting. The fruit is the most pungent part of the whole. The smell of the plant is perceptible at seven or eight paces distance, when a person is to leeward.

The natives of the country use it against the bite of the scorpion, by rubbing the wounded part with its bruised leaves. They also employ its warm infusion to wash the bodies of their children, in order to keep them healthy; and they feed camels with it, who love it naturally.

Dr. Garcin finding that this plant did not correspond in characters with any previously described plant, established a new genus, and applied to it the name Salvadora, in honour of M. Salvador, of Barcelona, a very skilful botanist, of whom M. Tournefort makes mention in the Introduction to his Institutiones Rei Herbareæ, where he styles him the Phœnix of his nation, because he was really the richest naturalist, and the most expert botanical traveller that Spain ever produced. Dr. Garcin also herborized with him before the siege in 1713 and 1714; and says, "I thought it incumbent on me to do honour to his memory, by giving his name to this plant, and I have done it with the greater justice, because it is certain that had he lived, he would have given a history of the plants of Spain, which by its accuracy would have afforded much pleasure to the botanists of Europe."

This plant is also described by Forskal, in his Flora Ægyptiaco-Arabica, published by Niebuhr in 1775, under the name of *Cissus arborea,* which he found at several places, as he mentions that at Surdud it is by the Arabs called رديف, *redif;* at Dabhi, راك, *rák*[1]; at 'Hashad (*Káhsad*), the tree is called ارك *örk,* and the fruit كباث *kebáth.* He also states that it is held in high esteem by the Arabs; that the fruit is edible, when ripe; the leaves when bruised applied upon the tumours called *harm,* &c.; that it is also so famed as an antidote against poisons, as to be celebrated in a song by some Arab poet:—

اراق النبات بطلع نبات مدور
يبع ثبات مق الرجال الكملي

He describes it as a shrub with smooth stem, opposite drooping branches, with the flowers arranged in terminal branches, which are afterwards followed by berries about the size of a pea, and containing a single seed.

Mr. Bennett informs me that the Salvadora persica was found in Egypt by Sir G. Wilkinson. Delisle gives us the locality "in Monte Gharab Egypti superioris." Endlicher, in his Genera Plantarum, gives as the geographical distribution of Salvadora persica, "per Asiam mediam, ab India superiore ad mare Mediterraneum, per Africam borealem a Nilo ad Senegambiam[2]."

---

[1] In Indian writers we see that ارك *irak,* is applied to the same tree.

[2] Mr. Johnson, in his recently published and interesting work, intitled, Travels in Southern Abyssinia, says, "The *Moomen,* or tooth-brush tree (Salvadora persica) abounded at Sakeitaban. Several of the Hy Soumaulee brought me a handful of the berries to eat; but I was soon obliged to call out, 'Hold, enough!' so warmly aromatic was their flavour. This singular fruit grows in drooping clusters of flesh-coloured, mucilaginous berries, the size of our common red currants, each containing a single round seed, about as large as a pepper-corn. The taste at first is sweet, and not unpleasant, and by some, I think, would be considered very agreeable indeed. After some little time, if many are eaten, the warmth in the palate increases considerably, and reminded me of the effect of pepper, or of very hot cress. As we approached the river Hawash, I found these trees growing more abundantly.

"The *moomen* forms a dense bush, some yards in circuit, and as their sleek, velvety, round leaves, of a bright green colour, afford an excellent shade, they form the favorite lairs, both of savage man and of wild beasts. Reposing upon the ground, near the roots, free from underwood and thorns, whoever, or

Having traced this tree, which so singularly coincides in name and in properties with what is required for the Mustard Tree of Scripture, from the extremity and coasts of the Peninsula to the North-Western provinces of India, and from that to the Persian and Arabian Gulfs, it is necessary for our purpose to ascertain that it is also found in Palestine. But in this I was long unsuccessful, as I was unable to find any notice in systematic botanical works, or in local Floras, of the prevalence of *Salvadora persica*, to the north of the situations in which Forskal had found it. I therefore had recourse to the works of travellers, especially of those who had paid some attention to natural history; but I was still unable to find any notice of such a plant in any of the lists of the Flora of Palestine. I then referred to the excellent digest of the information on Natural History subjects contained in books of travels in Palestine, in Mr. Kitto's Physical Geography and Natural History of the Holy Land, where at p. ccliii, with other unknown plants, I found an extract which is directly applicable to our subject:—

"Advancing towards Kerek, from the Southern extremity of the Dead Sea, Captains Irby and Mangles soon, on leaving the borders of that sea, entered into a very prettily wooded country, with high rushes and marshes. Leaving this, the variety of bushes and wild plants became very great: some of the latter were rare, and of remarkable appearance. 'Occasionally we met with specimens such as none of our party had seen before; a botanist would have had a fine treat in this delightful spot. Amongst the trees which we knew, were various species of acacia, and in some instances we met with the dwarf mimosa: we saw also the *doom*[1]; and the plant which we saw in Nubia, and which Norden calls the *oschar* (*Asclepias procera*). There was one curious tree which we observed in great plenty, and which bore fruit in bunches, resembling in appearance the currant, with the colour of the plum. It has a pleasant although strongly aromatic taste, exactly resembling mustard; and, if taken in any quantity, produces a similar irritability of the nose and eyes to that which is caused by taking mustard. The leaves of the tree have the same pungent flavour as the fruit, although not so strong. We think it probable that this is the tree our Saviour alluded to in the parable

---

whatever lies there is entirely covered from sight; and not unfrequently a leopard or a hyæna skulks out of, or a startled antelope bounds from the very bush that the tired Bedouin has selected for his own retreat from the sun." Travels, vol. i, p. 424.

Moomen is also the name of pepper, Mr. Johnson informs me.

[1] Not the Doom Palm of Egypt (*Cucifera thebaica*).

of the Mustard Seed, and not the mustard plant which we have in the North; for although in our journey from Byssora to Adjeloun we met with the mustard plant growing wild, as high as our horses' heads, still, being an annual, it did not deserve the appellation of "a tree," whereas the other is really such, and birds might easily, and actually do, take shelter under its shadow.'" Travels, p. 363; and p. 107 of Mr. Murray's edition, forming a volume of the Colonial Library.

From this it is, I think, quite evident that Captains Irby and Mangles fell in with the very tree, of which we are in search and have traced to Arabia; and which they were therefore the first to recognise as the Mustard Tree of Scripture, though their discovery has not attracted the degree of attention which it deserved. Their description is brief and imperfect, yet it contains enough to have convinced me, on first reading it, that the tree was the *Salvadora persica*. The properties being the same would not prove the point, for many plants have warm and spicy seeds, though we may not have succeeded in tracing them into Palestine. But when in conjunction with these properties we have it mentioned as a tree, having its fruit in bunches, something like the currant (whence no doubt Retz's name of *Grossularia*), we have a combination which is not usual among the trees of Europe, nor as far as I am aware, among those of Syria and Palestine. It is more than probable, that it is to this tree that the name *chardal* is applied by Talmudical writers; who state that it was large enough to be climbed like a fig-tree; that its branches spread over like a tent. These statements have been considered unworthy of notice by Dr. Harris, Rosenmüller, and others. But it is without doubt to the same tree that Mr. Ameuny applies the name *khardal*, and the seed of which he informs me is usually employed in Palestine for the purposes of mustard.

On further inquiry of Mr. Ameuny, (now attending my own class at King's College,) where this khardal tree was found, he informed me that he had seen it all along the banks of the Jordan, and very abundant in the neighbourhood of the Lake of Tiberias, and near Damascus. He also stated that it was so generally recognised in Syria as the Mustard Tree of Scripture, that the Reverend Storey Hebard had carried specimens of the plant from the shores of the above Lake to Jerusalem, not as a rarity, because the khardal tree is also found there, but as specimens to send to America, from the very locality where our Saviour had spoken the parable of the Mustard Tree.

As specimens of the plant, or accurate descriptions of it by a qualified botanist, would alone satisfy others of the existence of this plant in the above localities, and knowing that my friend Dr. Lindley had seen the collections of Bové, and those made in the expedition of Colonel Chesney, I wrote to him to inquire whether among these plants he had seen any specimens of *Salvadora persica;* and he informed me in reply, that *S. persica* was found on Mount Sinai by M. Bové, but that he did not see it among the plants collected in Colonel Chesney's expedition. This is however an interesting locality, as it thus connects the Arabian localities with those in which it had been found by Captains Irby and Mangles.

Having proceeded thus far, that is, having found in India a tree called *kharjal,* which has the same properties as the *khardal* of Syria, and then ascertained that *Salvadora persica* (the *kharjal* of Northern India) is found along the Persian Gulf and the coast of Arabia, even up to the neighbourhood of Mount Sinai, I thought that I had been the first to infer from their description that this was identical with the tree found by Captains Irby and Mangles, on the southern coast of the Dead Sea. But I was surprised in looking, with a totally different object, at Dr. Lindley's Flora Medica, to find the *Salvadora persica* there mentioned, as the tree supposed to be the Mustard Tree of Scripture. Having only recently obtained this information, I have been unable to ascertain the grounds upon which this supposition was entertained, as upon inquiry of Dr. Lindley he was unable to refer me exactly to the place where the speculation had been entertained either by Mr. Lambert or Mr. Don. But as my own conclusions had been arrived at by an independent course of investigation, to which I had been led by the Asiatic synonymes of the plant which is supposed in Syria to be the Mustard Tree of Scripture, I conceive them worthy of presentation to the Society as tending to confirm those of other inquirers.

On mentioning this subject casually to Mr. Bennett, of the British Museum, and Secretary to the Linnæan Society, he was good enough immediately to seek out the information, and favor me with the accompanying remarks, which were read at the Meeting of the Asiatic Society, on the 20th of April:—

"I find that both Don and Lambert have published notes on the Mustard Tree, suggested by the communications of Captains Irby and Mangles; but that both (instead of adopting) object to the inference of those travellers, that the tree observed by them was the Mustard Tree of Scripture, at the same time that they positively identify the Captains' tree with *Salvadora persica,* L.

"Don's observations are in Jameson's Edinburgh New Philosophical Journal, vol. ii., p. 306. After quoting the passage from Irby and Mangles, he says, 'On reading this passage, both Mr. Lambert and myself felt interested in ascertaining what the tree might be, and at first we were inclined to suppose it was a species of *Phytolacca*, with which genus the habit of the plant, as far as could be learnt from the above description, pretty well accords; but the examination of an authentic sample in the possession of Mr. Bankes [Mr. William Bankes, who was in Palestine at the same time with Irby and Mangles], has proved the supposition was unfounded, and that the tree is *Salvadora persica* of Linnæus, the *Embelia grossularia* of Retzius, and the *Cissus arborea* of Forskal.' Don then quotes Roxburgh's description of *Salvadora* for the sake of comparison, and speaks of it as 'found in Arabia, Syria, Persia, and India, between the parallels of 18° and 31° N. latitude.' He goes on to say, 'I am far from assuming this tree to be identical with the apocryphal Mustard Plant of the sacred Scriptures: indeed, the whole passage in the Gospel by St. Matthew appears to militate against such an opinion, and it would appear that some common agricultural herb of large growth had been intended by our Saviour in the parable; but whether the plant belongs to the same family with *Sinapis* of Linnæus, and for what purposes it was cultivated, are questions rendered quite problematical at this distant date. We are pretty certain, however, that it cannot be a *Phytolacca;* for it does not appear that any real species of that genus has been observed in Palestine.' He believes *Phytolacca Asiatica* of Linnæus, in the list of Hasselquist's plants, forming the 'Flora Palæstina,' (*'Phytolacca foliis serratis'* of the first edition of the 'Species Plantarum,) to be probably intended for *Salvadora persica,* 'with which Linnæus does not appear to have been ever well acquainted.'

"Lambert's 'Note on the Mustard Plant of the Scriptures,' is in Linnæan Transactions, vol. xvii., p. 449. He believes the plant to be literally *Sinapis nigra;* and relies for confirmation of this on the statement of Captain Irby and Mangles of the large size to which that plant sometimes attains in the Holy Land. The following is his reference to *Salvadora*: 'What Mr. Frost says about *Phytolacca* he took from some conversation he heard in my library, not relating to the mustard seed of Scripture, but to a plant mentioned by Captains Irby and Mangles, of which they brought me a specimen, and which proved to be *Salvadora persica,* found by them growing in a hot valley of the Holy Land.'"

Mr. Bennett also called my attention to Lady Calcott, having in her work, entitled Scripture Herbal, referred to the above information obtained from Captains Irby and Mangles. This I had overlooked, from Sinapis nigra, or the common black mustard, being the plant selected for illustration by her Ladyship.

It has therefore been ascertained beyond doubt that the Salvadora persica is found in Palestine, in the neighbourhood of the Dead Sea; and I think, considering the wide distribution of the plant, we may be allowed to conclude that the same plant is found on the shores of the Lake of Tiberias, and that it is there called *khardal*, or mustard. To some, the evidence by which it has been concluded that this is the tree alluded to in the parable of the Mustard Tree may not appear satisfactory; and they may think, as Mr. Lambert, that the common mustard plant is suitable to all that is required, especially as it is herbaceous as stated in the first part of the parable; has a small seed, and was probably cultivated in gardens. But this mustard seed is far from being the smallest of seeds, for even in Syria we have trees, as the poplar and willow, with small seeds; but still, speaking generally, mustard seed is small, as is also that of the *khardal*, or *Salvadora persica*, for anything that grows into a tree, and that, the parable seems to me to require. Mr. Don, though not satisfied with this, is as little so, with the common mustard; and fancies that some unknown agricultural plant of large growth was intended, but which it would now be difficult to discover. But to me there appears nothing improbable in the *Salvadora persica* itself having been so cultivated, and its herbaceous parts employed, as well as its seed, as a condiment. In fact, we might infer that it was so, for Rosenmüller mentions that a plant which he supposes was the common mustard, was at least by the later Hebrews cultivated as a garden plant. This is evident from the fact, that in the Talmud (Massroth, cap. IV., § 6,) its buds are mentioned amongst things which are subject to tithe. From this he infers that it was cultivated, because according to the general rule established in the Talmud (Massroth, cap. I., § 1) everything eatable, and which is taken care of, cultivated, and nursed (in gardens, or in ploughed fields), and which has its growth from the earth, is subject to tithe. If we were to take the foregoing passage literally, it would of itself be sufficient to prove, that the common mustard plant was not that alluded to, because herbaceous plants are without regular buds; and they are moreover not grown to a great size at the season when birds build their nests.

We may briefly, therefore, sum up the result of our inquiries. Our Saviour in the parable adduces a plant having a small seed, which being sown we may suppose in a suitable soil, grows up into a tree, or, as the Apostle Luke says, a great tree, in the branches of which the fowls of the air take shelter or build their nests. This tree is mentioned in the New Testament by the Greek name *Sinapè*, or mustard, and we may infer that it was spoken of by the Hebrew or

Syriac name of mustard, which, as in the Arabic, is *chardul,* or *khardal*[1]. Whatever the plant may be, we are justified in concluding that it possessed the properties of mustard, from the same name being applied to it. The Arabs, we have seen, enumerate several kinds of khardal or mustard; that is, the common, the wild, and the Persian kinds; and it has been shown that the ancients were in the habit of grouping things together, rather by their intrinsic properties than their external characters.

Having learnt that the tree which in Palestine is at the present day recognised as the Mustard Tree of Scripture is there called *khardal,* I was led to conclude that this was *Salvadora persica* before even I could prove that this tree had ever been found in Syria. It is a curious and interesting fact, and one which we cannot consider accidental, that in so remote a country as the North-West of India, the name *kharjal* should be applied to the same tree as *khardal* is in Syria. This proves the impossibility of collusion, or the recent application of the latter name to a plant of Palestine, merely to meet the exigencies of the case, as has been done in some cases by unscrupulous monks, who usually calculate on the credulity of their hearers being in proportion to their own ignorance. Subsequently I learnt that Captains Irby and Mangles had found a tree near the shores of the Dead Sea, which I concluded from their short description must be *Salvadora persica.* This I afterwards ascertained had already been determined by Messrs. Don and Lambert, from examination of specimens brought from the very locality by Mr. W. Bankes, and we find that it is a tree known both in Persia and Arabia, in India and Abyssinia, for its gratefully aromatic and pungent seeds, which we find employed at the present day in Syria for the ordinary purposes of mustard, and which we are therefore justified in concluding is the *chardal* tree alluded to by Talmudical writers.

In conclusion, it appears to me, that taking everything into consideration, Salvadora persica appears better calculated than any other tree that has yet been adduced to answer to everything that is required, especially if we take into account its name and the opinions held respecting it in Syria. We have in it a small seed, which, sown in cultivated ground, grows up and abounds in foliage. This being pungent, may, like the seeds, have been used as a condiment, as mustard and cress is with us. The nature of the plant, however, is to become arboreous, and thus it will form a large shrub, or a tree, twenty-five feet high, under which a horseman may stand, when the soil and climate are favourable. It produces numerous branches and leaves, among which birds may and do take shelter, as well as build their nests. It has a name in Syria which may be considered as traditional from the earliest times, of which the Greek is a correct translation. Its seeds have the pungent taste, and are used for the same purposes, as mustard. And in a country where trees are not plentiful, that is, the shores of the Lake of Tiberias, this tree is said to abound, that is, in the very locality where the parable was spoken. If we consider, moreover, the wide distribution of this plant, from Damascus to Cape Comorin, and from the Persian Gulf to Senegambia, we still find that it is well suited to illustrate the typical comparison of the doctrines of the Gospel, which though at first gaining only a few adherents, would in the end spread far and wide.

---

[1] Mr. Norris, Assistant Secretary of the Royal Asiatic Society, has favoured me with the following note:—"I have looked at the old Syriac version of the passages where the mustard tree is named, and find the word ܚܪܕܠܐ *khardalo.* The same is in the Chaldee. The modern Jews appear also to use the same word, for I find it in the Hebrew version of the New Testament."

ART. VII.—*Summary of the Geology of Southern India. By* CAPTAIN NEWBOLD, F.R.S., &c., *Assistant Commissioner for Kurnool.*

[*Read June* 15, 1844.]

PRELIMINARY. PHYSICAL SKETCH.

AREA AND GEOGRAPHICAL POSITION.

THE area, the geological features of which it is purposed to attempt a description of, so far as known, comprises peninsular India from Bombay on the west, and Ganjam on the east coast, to Cape Comorin, lying between the 8th and 20th degrees of north latitude. Its northern limit is skirted by the Sub-Vindhyan ranges, and the plains of Central India; while the remaining sides are washed by the ocean, and lie within the 72nd and 86th degrees of east longitude.

GENERAL PHYSICAL FEATURES.

The prominent physical features of this extensive tract have originated in the elevation of two mountainous ranges, marking irregularly the coast lines, and termed the Eastern and Western Ghauts; which support on their Atlantean shoulders, and inclose as in a massive framework, the intermediate table lands, at an altitude varying from 500 to 3000 feet above the sea's level.

From the basis of both these chains tracts of low land, with irregular and often abrupt elevations, varying from a mile to seventy in breadth, extend to the sea, and have been expressively styled by Mahommedan writers Payeen Ghaut, or land at the feet of the Ghauts, in contradistinction to the table lands, which they name Bala Ghaut, or land above the Ghauts.

WESTERN GHAUTS.

The elevation of the Western Ghauts commences in Khandesh, where it meets that of the Vindhya beyond the limits of the area under description; thence, pursuing a nearly south-by-east direction, interrupted by the singular gap of Paulghautcherry, it terminates a little above Cape Comorin, near the Amboli Pass, in a bluff granite peak about 2000 feet high. A low broken range extends from its base to the southern extreme of the peninsula. The extreme ascertained elevation of the Western Ghauts above the sea occurs in the Nilgherrys,—a little above the gap of Paulghautcherry,—8760 feet. Towards the north they rise, in the Mahabuleshwar hills, to the altitude of about 5000 feet. The most striking feature in this great dislocation is the comparatively precipitous façade presented by its sea, or western side. To the east, or inland, it usually slopes away gradually, to the general level of the table lands.

Along part of the base of the western flank gushes a line of thermal springs, which have been traced from the north of Bombay southerly to Rajapore, and probably extend still further south, concealed in the forests that clothe the feet of the mountains. I have found springs of a thermal character at the western base of the Eastern Ghauts, with a temperature from 88° to 89° Fahrenheit.

EASTERN GHAUTS.

The Eastern Ghauts are supposed to rise in the vicinity of Balasore, in lat. 21° 30′ N.; and, passing a little to the west of Ganjam, pursue a southerly course to Naggery, where they appear to terminate in the bluff height called Naggery Nose, about fifty-six miles north-west from Madras. Their course is here broken apparently by another line of elevation, which, sweeping irregularly inland, crosses the peninsula in a south-westerly direction by Chittoor, Sautghur, and Salem, and joins the Western Ghauts north of the gap of Paulghautcherry. The southerly direction of the first-mentioned elevation line is marked at intervals along the Coromandel coast by outliers and detached hills, and reappears in the almost contiguous island of Ceylon as a continuous mountain range. There is little doubt from this and other geological reasons, that Ceylon was raised above the ocean by forces similar to, and contemporaneous with, those that elevated the peninsula.

It is worthy of remark that, while the steeper declivities of the Western Ghauts face generally towards the sea, those of this cross range, or rather break in the continuity of the elevation, have usually a southerly aspect.

Below, or south of this great break, which I shall call that of Salem, the Eastern Ghauts, as just stated, lose the character of a chain, and reappear at intervals in detached hills, groups, and clusters, while the general level of the peninsula ceases to be sustained as a continuous table land. Some of these clusters rises to a considerable altitude: the Pulney Hills attain an elevation above the sea's surface of between 6000 and 7000 feet; isolated patches of table land not unfrequently occur on their summits. The average elevation of the Western Ghauts may be roughly stated at 4000 feet, and that of the Eastern at 1500 feet.

Geographically speaking, these great chains are separate and distinct; but, in a geological point of view, after a careful and extended examination of the intervening table lands, I am inclined, until further evidence be adduced, to regard the Western Ghauts south of Malwan, the Eastern Ghauts and their table lands, as part of one magnificent elevation of plutonic rocks, by a succession of efforts, during a period which may be termed plutonic, breaking up the hypogene schists; and, in some instances, uplifting aqueous beds of a more recent origin.

The true general direction of this elevation is nearly N. 5° W. though the apparent directions of the lateral chains on its flanks are, as we have noticed, to the east and west of north respectively.

PHYSICAL ASPECT OF TABLE LANDS OF SOUTHERN INDIA.

The surface of the table lands between these chains, extending from the Salem break on the south, and comprising the elevated plains of Mysore, the Ceded Districts, the South Mahratta and Hydrabad countries, and the Dekhan, ably described by Colonel Sykes, though usually presenting vast plains, which to the eye often appear perfectly horizontal, has a general inclination easterly by south towards the Bay of Bengal, into which the principal rivers empty themselves. This gentle inclination, often assisted by cross lines of elevation, determines the great drainage lines of the country, throughout our area, east of the Western Ghauts, and beyond it to the northerly slopes of the Vindhya, whence another system of elevation and drainage commences. Every traveller, who has ascended the Ghauts, is struck by the singular appearance, in plutonic areas, of detached hills, and clusters of hills, starting up abruptly from the surface of the flat plains spread before him, with little or no tali, presenting a *coup d'œil* which has caused the not inapt comparison of a table with tea-cups here and there reversed on its surface. These hills are usually naked masses of gneiss or granite, and seldom rise above 500 feet from the level of the plain. Some few exceed 1200, and the highest not 1800 feet; many have been selected by the natives as the sites of the Droogs or hill-forts so celebrated in the annals of Southern India.

The mean elevation of the table land around Bangalore and Nundidroog above the sea is 3000 feet. Northerly towards Hydrabad it sinks to 1800 feet; and a little south of Bangalore it falls, by rather abrupt steps, to the level of the plains of Salem and Coimbatore, (viz. 1400 feet,) whence, to Cape Comorin, the mean height of the country is about 400 feet. The average height of the low country between the Ghauts and the sea, on both the coasts of Coromandel and Malabar, may be roughly estimated at 200 feet, rising at the base of the mountains to 800 feet. Nothing can be more contrasted than the aspect of these coast tracts: while the former presents an open and comparatively bare, sandy plain, gently rising towards the interior, the monotony of which is diversified by a few detached hilly clusters, palm, cocoa-nut trees, and topes, planted by the hands of man; the latter is broken up by a succession of low irregular hilly spurs, separated by narrow marshy flats, covered with eternal forest, and often descending to the sea in precipitous cliffs.

Through these flats and ravines a number of mountain torrents stream, in the monsoon, from the Ghauts' steep sides; and, after a short but rapid course, rarely exceeding fifty miles, fall into the sea. North of Malwan, owing to the different geological character of the country, the physical aspect of the Western Coast undergoes a considerable change, being less clothed with forest, and its lowlands generally not so much elevated above the sea. According to Colonel Sykes[1] this part of the coast to Bombay, which is usually called the Konkan, presents a long strip of land from thirty to fifty miles in breadth lying between the Ghauts and the sea; the mean elevation of this strip is less than 100 feet, but it is bristled with isolated hills, or short ranges, some of which attain an elevation equalling that of the Ghauts. Numerous shoulders or salient angles are thrown out from the Ghauts on the Western or Konkan side, and by means of these the ascent to Dekhan is effected; with what difficulty, will be understood when I state that the military road of communication between Bombay and Poona up the Bou ghat rises nearly 600 feet in a mile.

RIVERS.

The large rivers of Southern India within our area, viz., the Godavery, Kistna, Toombuddra, Cauvery, and Pennaur, flow from the eastern slopes of the Western Ghauts, and, crossing the peninsula in an east-by-southerly direction, escape through singular fissures in the Eastern Ghauts to the plains of Coromandel, and the Bay of Bengal. The Godavery passes through the break of Papcondah; the Kistna and Toombuddra through that of Beywarah, and the Pennaur through those of Ganjicotta and Sidhout. The Cauvery alone, having descended from the table land southerly by the Salem break, turns easterly and falls into the sea below the southern termination of the Eastern Ghauts as a continuous chain. The Paniani, and the mountain streams that rise west of the anticlinal ridge, or watershed of the Western Ghauts, run westerly into the Indian Ocean. These fissures, and cross valleys, run nearly at right angles with the elevation line, and offer striking illustrations of the correctness of Mr. Hopkins's theory of the origin of the cross valleys of the Weald, a district, part of which I had recent opportunities of observing, during a brief visit to Europe. The great Himálaya chain appears to present similar phenomena on a scale of greater magnitude.

---

[1] Geology of the Dekhan, Transactions Geological Society, Second Series, vol. iv., pp. 409—432.

The gap of Paulghautcherry, previously mentioned, is evidently a continuation of the Salem and Nilgherry break, near the southern base of whose lofty precipices it opens an easy commercial road of communication between the interior and the sea. It would almost seem, that the strata of crystalline schists had been here broken asunder, across their direction, and to their very foundations, by the unusual energy evinced by the upheaving forces in the neighbouring elevation of the highest peaks of the Western Ghaut chain, viz., those of the Nilgherries and Koondahs, and that the shattered sides of this great rift had been swept away, and its aspect modified, by the current of the retiring ocean, above whose waves the granitic and hypogene summits of the Ghauts then first emerged.

The gap is from sixteen to twenty miles broad, narrowing towards its eastern extremity, the surface tolerably flat; and the descent from the plains of Coimbatore and Salem to the Malabar Coast, so gradual as to be almost imperceptible. Its height about the centre, roughly approximated by means of the boiling point of water, I found to be about 970 feet above the sea's level. It is covered with a reddish soil, mostly sandy, imbedding angular, or slightly worn fragments of the granitic and hypogene rocks, from the detritus of which the soil itself is evidently the result. Bare bosses of these rocks, in many places, protrude from the soil. The rocks on both sides are precipitous, greatly modified in external form by that process of exfoliation and splitting into cuboids, to which granitic rocks, and frequently the crystalline schists in contact, are subject.

It has been stated as a well known fact[1], that ships navigating the Malabar Coast during the N.E. monsoon commonly experience a stronger gale in the neighbourhood of Paniani (a town on the coast nearly opposite the western embouchure of the pass) than elsewhere; and this break in the Ghauts appears to be the cause of this effect.

---

[1] Madras Almanac, 1840.

During the S.W. monsoon it exerts a considerable influence on the climate of Coimbatore; particularly on that of places immediately east of it, or in a line with its longitudinal axis, by admitting, as through a funnel, and concentrating the full force of the strong westerly winds on the tracts within its focus. Its influence on climate in this respect is felt even farther east than Trichinopoly. At places situate centrically like Bellary between the Ghauts, the force of the monsoons is but slightly felt, from the protection afforded by those great natural barriers.

The influence exerted by the geological features of the regions of India not only over the climate, but over the commerce, government, the moral, social, and physical character of its singular and widely varying population, is in itself a study fraught with the deepest interest, and affords an ample and rich field, hitherto almost untrodden, to the research of the philosopher, and man of inquiry.

It may not be irrelevant to remark, in order to show more clearly the relative geographical position (in a physical sense) of the tract under description, that the whole of the vast continent of India, embraced by the Ganges, the Indus, and the Ocean, may be classed under four great physical divisions, independent of the climatic zones of altitude peculiar to each.

The first is that of *Himálaya*, and its subordinate chains, characterized by a general line of elevation running nearly W. 26° N., and a drainage flowing southerly and easterly into the Bay of Bengal.

The second, that of *Vindhya*, or Central India, with its low plains traversed by the Palamow and Vindhyan ranges, whose general direction is W. 5° S., with a drainage running in a similar direction to the Indian Ocean. This system of elevation serves to determine the drainage of the Himalaya to the east, and that of the plains intervening between its own constituent ranges to the west, from their otherwise natural southerly course.

The third is that of the *Ghauts*, or Southern India, already described, with a line of elevation N. 5° W., and a drainage running easterly and southerly to the Bay of Bengal.

The fourth and last is that of the Indus, flanking those of *Himálaya* and *Vindhya;* the great lines of drainage run S. by W. into the Indian Ocean, from the southern slopes of the *Hindoo Kosh*, whose course appears to be westerly[1].

---

[1] A fifth might be added, viz., that of *Maláya*, or Ultra-Gangetic India, comprising the Malacca peninsula, part of Siam, and Birma. This immense line of elevation, extending from the foot of the Himalaya system to the verge of the Equator, has a direction almost parallel to that of Southern India, with which it

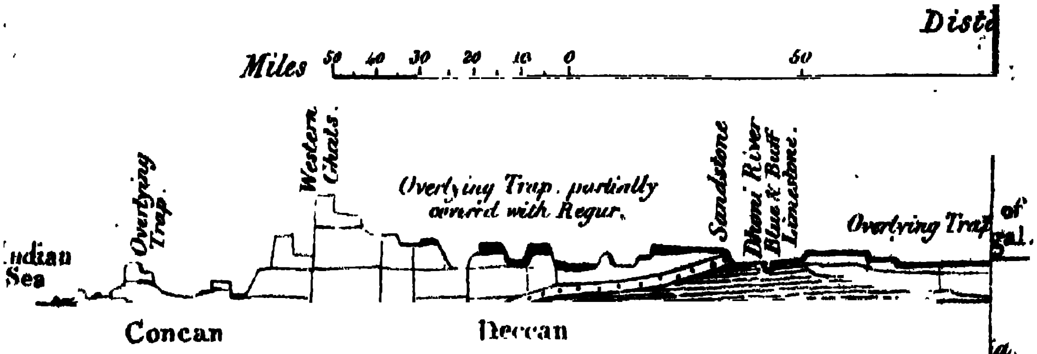
The above classification is susceptible of a number of subdivisions; many exceptions exist, chiefly arising from local physical causes, but the limits of this paper will not admit of my noticing them here.

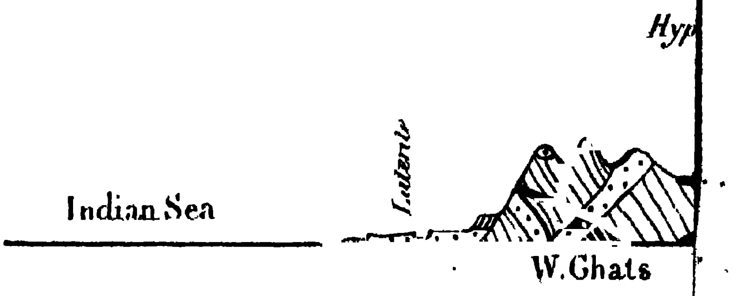
I shall now proceed to attempt a sketch of the geology of Southern India, as far as hitherto known, commencing with the inferior stratified, or hypogene rocks, following the ascending order. The plutonic and trappean rocks I have found it convenient to describe in the concluding portion of this paper

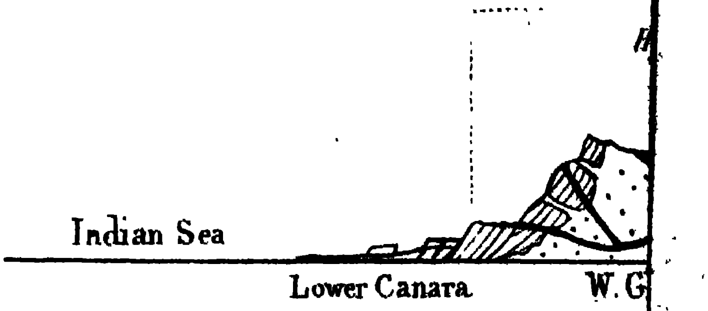
SUMMARY. PART I.

THE geology of Southern India will probably have little interest to the mere studier of organic remains, from the extremely limited extent of its known fossiliferous strata, yet the bare extensive surfaces of the granitic, trappean, and hypogene rocks, afford, on a grand scale, exposés, not to be surpassed in any other portion of the globe, of the protean aspects under which these rocks present themselves. The very absence of those fossiliferous beds which so thickly encrust the surface of a great portion of Europe, and many other parts of the world, is in itself a subject of interesting research; and the geological anatomist of the earth's skeleton may, in the peninsula of India, advantageously study a huge and disjointed mass of the nether-formed rocks which constitute the framework of our planet, and which here present themselves almost divested of integument, weathering under the alternations of a vertical sun, and the deluging rains of the tropics. Commencing with these rocks, I shall ascend to those more recently formed, in regular succession.

may possibly be found identical (in epoch.) On its northern portions the drainage is determined southerly by the great westerly elevation of the *Himálaya;* and entering the longitudinal valleys of the *Maláya* system passes southerly along their course to the Indian Ocean. The anticlinal ridge of the chain that runs down the interior of the Malayan peninsula, throws off its drainage to the east and west into the seas of China, India, and the Straits of Malacca. The granitic rocks that constitute a great portion of this ridge are remarkably distinguished, mineralogically, from those of Southern India by their highly stanniferous character.


Dist
Miles
50
40
30
20
10
0
50
Indian Sea
Overlying Trap.
Western Ghats.
Overlying Trap, partially covered with Regur.
Sandstone
Dhoni River
Blue & Buff Limestone.
Overlying Trap
of
gal.
Concan
Deccan


Hyp
Laterite
Indian Sea
W. Ghats


Indian Sea
Lower Canara
W. G

HYPOGENE SERIES.

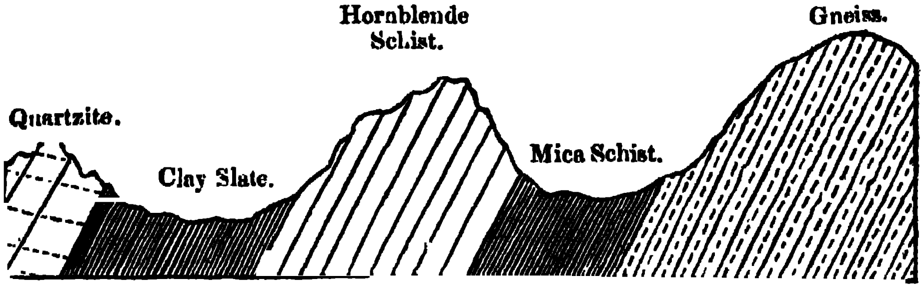
Extent.—Hypogene schists, penetrated and broken up by prodigious outbursts of plutonic and trappean rocks, occupy by far the greater portion of the superficies of Southern India. They constitute the great bulk of the Western Ghauts, from between the latitudes of 16° and 17° N. to Cape Comorin; and from the base of the Eastern Ghauts, from beyond the north limit of our area, to their deflection at Naggery, Lat. N. 13° 20′. They are partially capped and fringed, in the Western Ghauts, by laterite; and in the Eastern Ghauts, by sandstone, limestone, and laterite.

From Naggery to Cape Comorin, they form, with a few exceptions to be adverted to in due order, the basis of the plains of the Carnatic, Arcot, the Valley of Seringapatam, Salem, Trichinopoly, Coimbatore, Tanjore, Madura, Tinnevelly, and Travancore; and, intimately associated with granite, the principal hills and ranges on the low lands south of the Salem break and valley of the Cauvery. North of this valley, and above the break, they form the basis of the table lands of Mysore, the Baramahal, Bellary district, part of Hydrabad, and the Southern Mahratta country; and present a groundwork on which will be sketched out, as accurately as the present imperfect state of information will permit, the circumscribed areas occupied by more recent aqueous strata. Toward the north-west flank of our area, almost in a line drawn diagonally across the peninsula from Nagpore by Bijapore to the western coast, the hypogene and plutonic rocks disappear, emerging only occasionally, under one of the largest continuous sheets of trap in the world, and which extends far beyond our limits to Central India.

Physical aspect of Hypogene area.—The inequalities and undulations observed in the table lands and plains of Southern India, though originating in the dislocations and flexures of the metamorphic strata at the periods of their upheaval, have been evidently modified by aqueous erosion and by the faster weathering of the softer members of the series,—such as mica and talcose schists,—the softer clay slates and shales; which crumbling and washed away, have left their harder brethren standing out in relief on the face of the country.

Where we see gneiss, hornblende schist, and quartzite, rising in parallel ridges separated by valleys, we generally find the valleys occupied by the softer members of the series, often deeply covered with debris from the ridges.

The following section was taken from some low ridges on the table land of Mysore near Chinrayapatam.



Where gneiss rises above the general level of the surrounding plain, its elevations may be distinguished from those of granite, which the hills of thick-bedded varieties of gneiss sometimes assimilate, by their greater continuity and uniformity of altitude; their tendency to a smooth dome-shaped outline, and greater freedom from precipices and disrupted masses. Near lines of plutonic disturbance, however, these distinguishing marks are less perceptible.

Elevations of mica and talcose schists obtain, generally, a less altitude than those of hornblende or gneiss; and have a more round-backed and smoother contour on the whole; yet the outline in detail is jagged, owing partly to these rocks weathering in larger, more angular, or less concentric fragments; often leaving abrupt steps, and small precipices. Hornblende and gneiss are seen rising in the Western Ghauts, in the Nilgherries, to the height of 8000 feet above the sea's level. The former is recognised by its bold sharp ridges, often precipitous, but rarely presenting conical peaks.

Hills composed entirely of actinolite, or chlorite, schist are seldom met with: those of quartzite have long crest-like outlines, often running smoothly for some distance, but almost invariably breaking up into large, angular masses, sometimes cuboidal: the sides of the crests are usually precipitous. Hills of clay slate are distinguished by a smooth, wavy, outline, separated by gently sloping valleys. Outliers, or detached hills, of this rock are usually mammiform. But, as before remarked, all these normal crystalline rocks, when near lines or foci of plutonic disturbance, frequently undergo great changes in physiognomical aspect; and in lieu of the smoothly rounded hills of clay slate, and its gently sloping vales smiling with fertility, we behold it cleaved into sterile, rugged ravines, and rocky precipices.

Order of Stratification.—Gneiss is usually found lowest in the series: next to it mica and hornblende schist, actinolite, chlorite, talcose and argillaceous schist, and crystalline limestone, in due succession: but to this rule there are numerous exceptions I have observed all these rocks, except crystalline limestone, resting on granite without the usually intervening gneiss. Why these beds, termed metamorphic from the supposition of their having been deposited from water, and crystallized by the influence of plutonic heat, should not have all been similarly altered is difficult to explain, unless it is supposed that their mineral composition differed originally, and that various degrees and durations of heat will produce different effects upon the crystallization and mineral arrangement of the mass acted upon.

Dip and Direction.—The strata are often violently contorted, or bent in waving flexures, particularly in the vicinity of plutonic rocks; and much irregularity occurs in the amount and direction of dip throughout the hypogene area. In the Western Ghauts it is usually easterly, and at angles varying from 10° to 90°. In the Udigherry portion of the Eastern Ghauts and in the plain at their eastern base I found the dip often westerly, and varying as above from 10° to 90°.

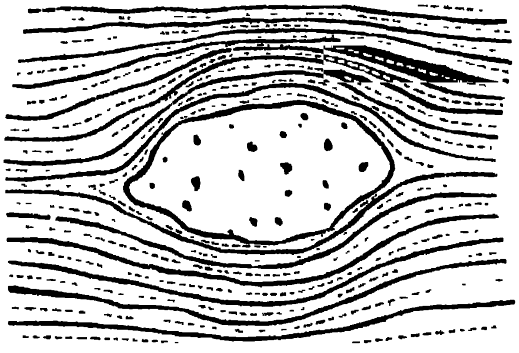
The dip in the plains south of the Salem dislocation, and in the gap of Paulghautcherry, is for the most part to the S.S.E. at angles from 30° to 80°. In the low lands at the west base of the Western Ghauts at Honawer, it was easterly at an angle of 30°; a little further, S.S.W. At the summit of the Ghauts near the falls of Gairsippa, the gneiss dipped at an angle of 35° to the N.E.

On the table lands the dip also varies much in intensity and direction: among the Kupputgode hills, in the South Mahratta country, it was in one situation quaquaversal; and Benza observed the hornblende schists at the east and west bases of the Nilgherries dipping anticlinally from the axis of elevation; but they do not always dip from the plutonic rocks—in many instances the dip is towards them: a fact, indicating that the strata have been disturbed at some previous period, or that they may have suffered inversion; which is known to be the case in beds of more recent origin. While the dip of the two great lines of elevation, viz., the East and West Ghauts, is generally westerly, and easterly, or at right angles with the direction of the strata, that of the minor cross ranges is usually southerly. Numerous irregularities and exceptions, however, to this general rule occur, particularly near the northerly and southerly great synclinal line of dip on the table lands between the Eastern and Western Ghauts, and near localities where it is traversed by the cross lines of elevation. The intrusion of trap dykes has also caused much diversity in the dip. These irregularities will always prove obstacles in tracing out with accuracy the synclinal dip line between the Eastern and Western Ghauts.

Joints and Cleavage.—The jointed structure is most observable in the thick-bedded variety of gneiss, the hornblende schist, and quartzite; in the two latter it is often so strong as to deceive some observers, who have taken the joint planes for the lines of stratification, which they cross usually at right angles, or nearly so. The planes of cleavage are most distinct in the chlorite and clay slates; they are sometimes parallel with the joints, but more frequently with the lines of stratification, which are often remarkably indistinct in the clay slates.

Lithologic Character.—Gneiss and hornblende schist are by far the most prevalent rocks of the series: to gneiss the other members may be termed subordinate. Near its contact with the granite it commonly assumes the character of, what has been styled by Boué, granitoidal gneiss, losing its stratified appearance, and not to be distinguished in hand specimens from granite. Spherical and oval masses of granite, resembling boulders, are sometimes observed impacted in the gneiss.

The following is a sketch of one of these bodies imbedded in the gneiss of the Western Ghauts, in the Paulghautcherry Pass near Vaniencolam.



These have certainly more the appearance of imbedded boulders of granite, than the concretions we see in the sandstones of Europe; while others again assimilate the globular forms produced by heat in regularly sheeted trap rocks. Veins of reddish compact felspar, felspar coloured green with actinolite, epidote or chlorite, with, and without, quartz; also of milky quartz with nests of iron ore, mica and hornblende, are very common in gneiss: also dykes and veins of granite. All these veins are of older date than the intrusion of the greenstone dykes which invariably sever them. Particular varieties of gneiss prevail in different districts. Protogenic gneiss, viz., gneiss where the mica is replaced by talc, is found in the western parts of

Mysore; albitic gneiss, in the Eastern Ghauts above Beswara. Garnets are universally distributed: but in the greatest abundance in the gneiss of the Eastern Ghauts. The gneiss of the Eastern Ghauts is also lithologically distinguished from that of the Western Ghauts by its less auriferous and more cupriferous character, and by its assuming, in many places north of the Kistna to Ganjam, so arenaceous a texture and colour as hardly to be distinguished from sandstone in hand specimens; and where capped by true sandstone, it is difficult to say where the gneiss ends or the sandstone begins. The mica and felspar are replaced by quartz and minute garnets, coloured and loosely agglutinated by peroxide of iron. The felspar is often aggregated in veins, decomposing into a white clay. It is a fact worth remarking, that the gneiss in contact with granite almost invariably assimilates the latter in mineral character. The grand characteristic of these rocks, however, on the Indian peninsula is their highly ferriferous nature, which remarkably distinguishes them from the stanniferous hypogenic and granite rocks of the sister peninsula of Malacca, which has an almost parallel direction and is separated only by the Bay of Bengal. In Southern India these rocks not only abound in nests and veins of rich magnetic and oxidulated iron ore, but in thick interstratified beds and mountain masses of these minerals, while not a grain of tin ore has hitherto been discovered.

Mica Schist.—Mica schist is found sparingly distributed over the whole of the hypogene area in thin beds. It is found in the greatest abundance and purity in the western parts of Mysore. I do not remember ever having seen in it a vein of granite, though abounding in those of quartz. Talcose, chloritic, and actinolitic schists are still more sparingly distributed: the first is seen in the western parts of Mysore; near Salem, in the valley of Cauvery; and in the Eastern Ghauts, in beds of some thickness; as also chlorite slate. Fine varieties of actinolitic schist occur in the Western Ghauts at the falls of Gairsippa; near Palliconda, and Suntghur in the Carnatic; and it is pretty generally distributed in thin beds over the Bellary districts, Mysore, and in the western and southern portions of the Nizam's territories.

Hornblende Schist ranks next to gneiss in extent and thickness of beds, and is seen washed by the sea at the bases of the Eastern and Western Ghauts, forming some of the loftiest peaks of the latter, and supporting large level tracts of table land. This rock varies from the compact structure of basalt to the crystalline texture of granite, and to that of porphyry, and may be seen from laminæ of a few lines in thickness, passing into beds forming mountain masses. The principal constituent minerals of this rock, for which so many different names have been applied by geologists according to the preponderance of one or the other, its laminar, or thick-bedded structure, degree of crystallization, &c., are hornblende and felspar. Quartz, garnet, and mica are frequently mixed. Near the junction with granite I have observed, in some situations, the hornblende rock appear to pass, like gneiss, into granite by insensible gradations: the change in this instance is the more striking, as the hornblende rock not only loses its bedded structure, but, on account of its darker colour, the change in its mineral arrangement is more perceptible than in the gneiss: the hornblende and felspar gradually separating, assume the granular and crystalline structure of granite, the resemblance still increased by the appearance of a few scales of mica. The granite, in its turn, often becomes hornblendic. It must not be forgotten, however, that, in most instances, when these rocks come in contact, the line of demarcation is tolerably distinct. The occasional passage of this rock into granite will serve to distinguish it from the greenstone of the dykes in granite, and in the hypogene strata, with which it has been confounded; the latter rock, though sometimes slightly blended at the contact, I have never witnessed passing insensibly one into the other. The needle-striped crystals of augite observable in the basaltic greenstone of the dykes, its generally more compact and homogeneous structure, and greater freedom from quartz and felspar in a separate state, may serve as empiric distinctions between the two.

Large beds of compact felspar, generally of a pinkish hue, with a little quartz, and a few scales of mica, quartzite,—the Arkose of Brongniart,—and milk quartz, having a similar direction to that of gneiss, &c., occur forming low ranges of hills. Interstratified garnet rock is met with at the base of the Eastern Ghauts, in the Nilgherries, and at Senklidroog in Salem.

Hypogene limestone (marble) is of such rare occurrence as to have entirely escaped the notice of most geologists who have written on this part of India. Captain Macpherson[1] mentions a "primary limestone" laminated by argillaceous matter in the neighbourhood of Nundigamah near Bezwarah, in the Eastern Ghauts, but was unable to ascertain its exact situs. Calder[2] states its occurrence in the Tinnevelly district near Courtallum; and I have seen it, in extremely thin layers, in the hornblende schist of Dummul, of the South Mahratta country, and in that of the Copper Mountain range at Bellary, and also in the garnitic gneiss of Senklidroog and Karpur (Salem district). The deficiency of this member of the metamorphic series, so largely developed in the Alps, is almost equally remarkable in the hypogene rocks of the Grampians, and in those of Norway and Sweden. It exists, doubtless, in Southern India in more localities than those just specified, but in such paucity as forcibly to exemplify the truth of Mr. Lyell's remark, viz., "that the quantity of calcareous matter in metamorphic strata, or, indeed, in the hypogene formations generally, is far less than in fossiliferous deposits." Why this should be so has been attempted to be explained by the theory of the non-existence of those mollusca and zoophytes by which shells and corals are secreted, at the period when the hypogene rocks were deposited. Others, again, are of opinion, that when these strata were broken up by the grand outbreak of plutonic rocks, the same heat which imparted to them their present highly crystalline texture, expelled from them the lime and carbonic acid. Neither of these theories, taken individually, appears to be satisfactory. It seems more reasonable to suppose that, during the earliest phases of the history of our planet, when the hypogene rocks were deposited, lime was far less abundant on its surface than at present; for although it has not been proved that lime-secreting molluscs and zoophytes did not exist in the ancient waters from which the metamorphic schists were deposited, yet it seems proved, from their scarcity in the lower rocks, that they must have existed in far less numbers than at subsequent periods.

---

[1] Asiatic Researches, Vol. XVIII., Part II., page 18.

[2] Ibid., Part II., page 8.

The other, and principal source from which the lime on the earth's crust has been derived, is springs of water charged with carbonate of lime brought up from beneath its surface. If we assume that the greatest quantity of lime is brought up from calcareous rocks in the interior of the earth, when fused or heated, during periods of plutonic activity, as would seem to be the case by springs of water charged with this mineral abounding in volcanic districts, it will be readily admitted, that but little lime was deposited during the period of repose in which the hypogene strata were accumulating under the ocean; and that a large development of it took place, when by far the greater bulk of these beds were broken up and uplifted. At all events, there can be no question that the deposit of lime brought up from the earth's interior by springs, many still in operation, must be greater now, than when it commenced at a remote geological era.

Clay-slate.—Clay-slate does not occupy a large surface of the hypogene area. Its principal localities are in the Nellore and Guntoor copper district; around Darwar; in the Ceded Districts, near Bellary and Sondoor; in the south-west portions of the Nizam's country, at Idlapur and Cundagal. It is generally associated in conformable strata with beds of chlorite and hornblende schists, also of quartzite and siliceous schists. Blue roofing slate is rare. The siliceous schists of Sondoor, Darwar, Ceded Districts, &c., often pass into a striped jasper, and may be classed under M'Culloch's second division of schist, viz.:—

"F. Laminar, with alternate colours, and forming some varieties of the striped jasper of mineralogists. The colours are commonly shades of red, brown, yellow, and purplish black, and these kinds appear to be derived from the coloured shales.

"G. Containing imbedded crystals of quartz, and of a porphyritic aspect."

This rock is usually seen cresting hills of chlorite, hornblende, or clay-slate, regularly interstratified. At other times the stratification is obscure; the structure, usually laminar, sometimes puts on the aspect of a breccia that has the appearance of the laminar variety having been broken up, and re-cemented *in situ* by a dark brown ferruginous paste. The rock is often highly ferruginous, and composed of alternate layers of magnetic iron ore with polarity, and grey, or brownish-grey chert. Basanite occurs associated with the hornblende, chlorite, and clay-slates.

It would be endless here to enumerate the various aspects under which the hypogene rocks present themselves dependent on mineralogical differences. The numerous divisions into which M'Culloch has petrologically classed them may be all observed in an area of a few miles' extent. Their mineral character has, however, been minutely described in my more detailed geological notes published in the Journals of the Bengal and Madras Asiatic Societies.

Imbedded Minerals in the Hypogene Rocks: Earthy Minerals—Silica.—Fine crystals of quartz are found at Vellum, near Tanjore. Chert is pretty generally distributed, also the common garnet; the latter occurs in the greatest abundance in the Eastern Ghauts, the Copper Districts of Nellore and Guntoor, Salem, the Nilgherries, and in the Western Ghauts below Goa. Mines of the precious garnet, almandine, have been excavated by the natives at Gharibpett near Palunshah in the Nizam's territories. Pyrope is said to be found in the central parts of the Peninsula: green garnet occurs in the gneiss of Senklidroog, in the Salem District[1]; dodecahedral garnet, assimilating essonite or cinnamon stone, in the hornblende schist of the Nilgherries[1]; and black garnet, and tremolite in the granitoïdal gneiss of Peroor and Wurralconda (Mysore). Epidote and actinolite are found usually in quartz and felspar veins. Hypersthene is occasionally seen in the hornblende schist of the Ceded Districts. Indianite occurs sparingly with corundum, fibrolite, and garnet in gneiss and hornblende schist in the valley of the Cauvery.

---

[1] Benza, Madras Journal of Literature and Science, Vol. IV., pages 266, 267.

Earthy Minerals: Alumina—Corundum.—Bournon considered indianite and fibrolite to be the matrix of corundum in Southern India; and Phillips states, on what authority is not mentioned, that its gangue in the Carnatic is a coarse-grained white marble. I have always found it, both in Mysore and Salem, in talc, mica, or hornblende schist, associated with iron ore, asbestus, and sometimes indianite and fibrolite. It occurs imbedded in the rock in grains and crystals. Viralimodos and Sholasigamany are its principal localities in the valley of the Cauvery; Golashully and Kulkairy in Mysore, where it also occurs at Mundurim[2], near Seringapatam, Tippaty, Beygoor, Bannercota, Baugoopilly, and other places. It is also said to be found in the hypogene schists of Nellore and Guntoor. The spinel ruby (dodecahedral corundum), and sapphire (the corindon hyalin of Haüy), are occasionally found with the common corundum in the Salem district, and in the valley of the Cauvery. Emery, or granular corundum, is found at Bombardipádu[3], about twenty-four miles northerly from Tripaty in North Arcot, in hornblende rock, in pieces varying from the size of a pea to that of a hen's egg, or even larger. Common corundum is also found where the Godavery escapes though the Eastern Ghauts, east of Papconda, from the Nizam's territories to the plains of Rajahmundry and the sea. Beryl occurs at Paddioor in Coimbatore; and, according to the natives, at Vaniambadi, at the north base of the Nilgherries.

Fibrolite occurs but rarely with indianite and corundum, as has been before alluded to, in speaking of the last two minerals. Kyanite I found associated with adularia, asbestiform tremolite, and magnetic iron ore, at Adipuram; in the Nellore district, in gneiss: it occurs in the same rock near Gharibpett[4], in the Nizam's territories; also in Mysore[5], and in the maritime districts of the Godavery and Kistna[6], with tremolite, pearl spar, bitter spar, almandine and staurolite. The last-mentioned mineral occurs in the hypogene and plutonic rocks north of Ryacota, in the Baramahal, associated with hornblende, felspar, and epidote[1].

---

[1] Macgregor, Madras Quarterly Medical Journal, July, 1842, page 284.

[2] Clarke, Madras Journal, January, 1839, page 121.

[3] Hayne's Tracts, page 110.

[4] Voysey.

[5] Clarke, Madras Journal of Literature and Science for January, 1839, p. 120.

[6] Macpherson, Asiatic Researches, Vol. XVIII., page 120.

Earthy Minerals: Magnesia.—Steatite occurs in the talcose schists in the western parts of Mysore; as also potstone, in beds of considerable size, and veins, and more or less dispersed over the whole hypogene area; occasionally associated with nephrite.

Alkalino-Earthy Minerals: Potash.—Mica is found universally diffused. In some parts of the Western Ghauts, and on the table lands to the east, this mineral and talc are found in plates large enough for windows, and lanterns; for which purpose they are used, as also for ornamental devices, and for painting on, by the natives of India. Chlorite is rarely found uncombined with felspar, silex, or hornblende. Nacrite, or scaly talc, is here and there met with. Adularia is found in the gneiss at Adipuram, in the Nellore district, and other places.

Alkalino-Earthy Minerals: Soda.—Albite, or cleavlandite, occurs pretty abundantly in the gneiss of the Eastern Ghauts above Bezwara, north of the Kistna, at Paddioor in Coimbatore, and occasionally throughout the gneiss districts of Southern India: as also tourmaline, or schorl, both black and green.

Acidiferous Earthy Minerals: Alumina and Lime.—Sulphate and sub-sulphate of alumina are occasionally found in thin incrustations and efflorescences between the layers of the soft ferruginous slates into which the hornblende and mica schists pass; for instance, in the Copper Mountain range near Bellary, where I have also observed calcareous spar in nests in the gneiss and hornblende schist. General Cullen has found calcareous spar in the gneiss of Travancore. This mineral is of rare occurrence in the hypogene rocks of Southern India. Bitter spar is said to occur[2] in the maritime districts of the Kistna and Godavery.

Acidiferous Earthy Minerals: Magnesia.—Magnesite, an almost pure carbonate of magnesia, occurs in beds, veins, and nests in the hornblende and talcose schists near Salem, associated with rocks analogous to serpentine, or chromiferous ophiolite, asbestus, chert, a silicate of magnesia, nephrite, and chromate of iron: also at Yedichicolum, and other places on the banks of the Cauvery; and in the vicinity of Hoonsoor in Mysore. In geological situs, and age, the magnesite of Southern India assimilates the older magnesites of Styria, Moravia, Baltimore, and Turin.

---

[1] Hayne's Tracts, page 345.

[2] Macpherson, Asiatic Researches, Vol. XVIII., p. 120.

Metalliferous Minerals: Iron.—Iron pyrites, or sulphuret of iron, is distributed in small proportions in the hypogene rocks; but the oxides, both magnetic and hæmatitic, exist in extraordinary abundance, forming masses and large interstratified beds in mountain chains. In gneiss these ores frequently replace hornblende and mica; alternating with quartz in regular layers. Magnetic iron ore with polarity is found at Pakanandoo, in the Salem district, in beautiful octohedral crystals. It occurs in the massive state on the Baba Booden hills in Mysore, those of Kittoor and Darwar in the Southern Mahratta country; in large masses among the hills of Sondoor near Hospett, and in many other localities.

Micaceous and specular iron ore are less common. A dark magnetic iron sand is usually found, in the beds of streams having their origin among hypogene rocks, associated with gold dust; and sometime with menaccanite.

Titanium.—Iron ore slightly titaniferous is found over the whole hypogene area. Menaccanite I found among the iron sand, and gold dust in the best of the Doni rivulet among the Kupputgode hills, and in some of the rivulets of the Ceded Districts.

Manganese.—The black oxide of manganese, associated with iron ore, is found in considerable quantities among the Kupputgode hills, and more sparingly in those of the Ceded Districts, Mysore, and the Nilgherries.

Chrome.—Chromate of iron occurs associated with the magnesite of Salem, and probably exists in other magnesite localities.

Copper.—Ores of copper, principally the green carbonate and sulphuret, occur in strings, nests, nodules, and short broken veins in the gneiss, mica, and hornblende schists of the Nellore and Guntoor districts. The carbonate is also found among the Kupputgode hills, in the Copper Mountain near Bellary; and in various localities in the Eastern Ghauts. The rarity of a regularly continuous lode of ore in the rocks of India is a remarkable peculiarity, and has hitherto discouraged the exertions of miners. However, our knowledge is confined to veins near the surface: and I do not consider that up to the present a fair trial has been made of their mineral resources.

Silver.—Ores of silver are said to occur in Madura, and also in Mysore[1]. I found a single fragment of the grey carbonate in the auriferous sands of the Doni rivulet in the Kupputgode hills. The rocks in all these localities are hypogene and plutonic. In the Doni rivulet the sand contained magnetic iron sand, menaccanite, carbonate of copper, and a grain or two of a white metal, soluble only in nitro-muriatic acid,—probably platinum. Two bits of metallic silver and copper were also found in the sand here, which from not being *in situ*, and the possibility of their being adventitious, cannot be safely pronounced as native.

---

[1] Clarke, Madras Journal of Literature and Science for January, 1839, p. 120.

Antimony.—This mineral is said by Dr. Clarke[1] to occur in the Baba Booden hills of Mysore. What is generally sold as surmeh, or antimony, in the bazaars of Southern India, and used largely as a collyrium by the natives to improve the brilliancy of the eye, I have fund to be a micaceous iron ore. Galena, or sulphuret of lead, is said to be also substituted.

Combustible Minerals: Graphite.—Graphite I found in thin shales in the gneiss of the south-west part of the Nizam's dominions at Nundapur.

Many minerals common in the hypogene series of Europe have not yet been noticed in this class of rocks in Southern India; such as fluor spar, barytes, strontianite, apatite, chiastolite, pyonite, andalusite, antomolite, and a number of other minerals less frequent.

Zircon is said to occur in the alluvium at Ellora, and cats'-eye in that of the Kistna, and of the rivers in Malabar; and umber in the Nilgherries. I have little doubt that the labours of future mineralogists will add greatly to this list of minerals associated with the hypogene formation of Southern India.

In concluding this summary of the metamorphic rocks of Southern India, I cannot refrain from remarking how forcibly they recall to mind the remark of the illustrious Humboldt, who, in concluding his survey of the plutonic and hypogene series of South America, says: "When we pass to another hemisphere, we see new forms of animals and plants, and even new constellations in the heavens; but in the rocks we still recognise our old acquaintances; the same granite, the same gneiss, the same micaceous schist, quartz rocks, &c."

PART II.

DIAMOND SANDSTONE, AND LIMESTONE.

RESTING immediately on the hypogene and plutonic rocks are found beds of limestone, sandstone, and sandstone-conglomerate (the latter often imbedding diamonds)—argillaceous, arenaceous, and siliceous schists, which, from their being usually associated, sometimes alternating, and their frequent conformability of strata, it has been thought convenient, until the discovery of distinguishing fossils, to describe under one head.

---

[1] Clarke, Madras Journal of Literature and Science for January, 1839, p. 120.

Geographical extent and position.—Next to the hypogene schists, just described, and the associated plutonic rocks, these limestone and sandstone beds occupy, perhaps, the greater portion of our area north of a line drawn from Pulicat to Mangalore on the south, and the southern edge of the great overlying trap formation on the north. In the south of India, from Cape Comorin to the Salem Break, they have not hitherto been seen; and, what is remarkable, they appear almost wholly confined to the elevated table lands, and to the Eastern Ghauts, which they cap at intervals from Naggery to beyond the northern limit into Cuttack. Below the escarpment of the Western Ghauts the sandstone has only been observed at Atchora[1], on the Malabar coast.

Dipping at a considerable angle to the north-west, the limestone has not hitherto been seen either on the maritime plains below the Eastern Ghauts, or in those of the Western Ghauts. On the tablelands these works are most frequently observed, exposed in the vicinity of the great drainage lines of the country—for instance, those of the Godavery, Bhima, Kistna and Gutpurba, Malpurba, and Pennaur. They occur in irregularly-shaped patches, separated usually by broad and apparently denuded zones of the subjacent hypogene and plutonic rocks.

Physical aspect.—The tracts occupied by the limestone and sandstone beds present a diversified aspect, sometimes flat and monotonous, and at others, near lines of plutonic disturbance, bare, rugged, and picturesque. The limestone in some situations has evidently been denuded of the usually superjacent sandstone, dislocated, and elevated several hundreds of feet above the general level of the surrounding country in regular ranges, and often in highly-inclined strata, as in the tract between Banaganpilly and Gooty. Caps of sandstone, though in such cases often wanting, are sometimes seen still covering the limestone peaks. The outline of these limestone ranges usually presents long, flattish-topped ridges, whose sides and summits are not unfrequently covered with detached angular blocks of the rock, with a grey, weathered, and scabrous exterior, resembling that of the mountain limestones of Europe.

The sandstone, where undisturbed by plutonic intrusion, occurs in low, flat, wall-like ranges, rising at an almost similar level, rarely exceeding 500 feet from the surface of the surrounding country, supporting table lands of some extent, and evidently once continuous. It is often intersected by deep fissures, extending from the summit of the rocks down to the base. These sometimes run through and divide entire hilly chains, in a direction at right angles to their course, and not unfrequently afford outlets to the streams that cross the Peninsula from west to east on their passage to the Bay of Bengal. The direction of the fissures is sometimes zig-zag, as in the remarkable gap of Ganjicotta on the table land of the Ceded Districts, through which the Pennaur flows, washing the bases of the precipitous and picturesque cliffs that form its sides. In some instances these great cracks in the sandstone have been widened and altered by the force of the streams that find a vent through them.

---

[1] Malcolmson, Geological Transactions, Vol. V., page 367, Second Series, Part III.

When disturbed by plutonic force, the sandstone exhibits a striking contrast in its outline to the tame horizontal aspect it assumes at distance from the axes of disturbance. It rises in bold relief against the sky in lofty rugged cross, or hog-backed and crested hills, with precipitous mural ridges, which, rarely running at the same level for any distance, are interrupted by portions of the same ridge thrown up at various angles with the horizon in steep and often inaccessible cliffs. These features are more strikingly seen in the ranges east of Gooty, on the edge of the granitic rocks, and in the Eastern Ghauts in the vicinity of Naggery, Udigherry, and in some parts of Goomsur. When it crests the hypogene rocks, the lower part of the elevation is often composed of the latter to the height of about 200 to 400 feet, the slope of which has usually an inclination of from 15° to 20°, while that of the cap of sandstone presents a steep or precipitous declivity varying from 45° to 90°, giving a decided character to the aspect and configuration of the mountains and ranges thus formed.

The hills of arenaceous schists are to be recognised from the more massive sandstones by their undulating, round-backed summits, and their buttressed and dimpled flanks; while those of the softer slates and shales affect the mammiform outline.

Both limestone and sandstone beds there is little doubt were formerly of greater extent than now, and owe much of their present discontinuity and scattered positions to the agency of plutonic disturbance, and subsequent denudation. The tracts of country intervening between their areas are usually occupied by granitic and hypogene rocks. The superincumbent beds, broken up by the granite rising to the surface, have been more easily carried away by aqueous currents, than in undisturbed situations, where we find their continuity greater. To admit this, it will be necessary to adopt the theory of the granite's rising above the surface in a solid, or a nearly solid, state. It is a fact, that in granitic tracts the denudation has been most complete.

I shall now proceed to notice, in detail, the extent, &c., of the various detached portions, or patches, of the limestone and sandstone strata.

Cuddapah Beds.—The Cuddapah beds appear to be the most extensive, occupying an area of about 9000 square miles, comprised between the 13th and the 17th degrees of north latitude. They extend east and west from the Eastern Ghauts over the table land of the Ceded Districts, to the village of Yaripilly, about nine miles east of the fortress of Gooty, and to Peddapa. On the north they stretch from the left bank of the Kistna, near Waripilly, covering the eastern and central portions of the Eastern Ghauts to Naggery, the adjacent table lands of Cuddapah, Kurnool, Tripetty, and part of North Arcot, to the north frontier of Mysore, near Rayachooty. It meets the hypogene and plutonic rocks of Hyderabad near Myapoor, a village on the left bank of the Kistna, about nineteen miles northerly from the city of Kurnool.

Godavery Beds.—A number of small outlying patches stud the plains between the Kistna and the Godavery; and the sandstone is seen at intervals capping the Eastern Ghauts, and forming low ranges stretching into Cuttack beyond our limits.. Near the diamond mines of Condapilly, on the north bank of the Kistna, it appears to touch the Cuddapah beds, which are seen in the channel of the Kistna at Amráwati. Further inland, on the north-east extremity of the tract under description, another patch extends in a south-eastern direction on the banks of the Godavery, commencing to the north-west of its confluence with the Banigunga, and traceable to the hot springs of Budrachelum, on the south-east[1]. Others occur at intervals on the banks of the Godavery at various distances to the alluvial plains of Rajahmundry near its embouchure.

South Mahratta Country Beds.—Separated by a zone of outcropping hypogene and plutonic rocks, about a degree and half in breadth, from the Cuddapah beds, and immediately to the westward of them, lie those of the South Mahratta country, extending north and south from the vicinity of Chimlughi, near the confluence of the Kistna and the Gutpurba, to Gujunderghur on the south, and from Moodgul on the east, to the subordinate chains of the Western Ghauts at Gokauk, and thence stretching down southerly towards Belgaum. The hill-forts of Pedda and Chich Nurgoond, and of Nowlgoond, stand on outliers a little below the southern limit of this patch. The course of the Gutpurba forms an irregular boundary to the north, with the great overlying trap of the Dekhan.

---

[1] Malcolmson, Geological Transactions, Vol. V., Second Series, Part III, pp. 567, &c.

Hydrabad Beds.—Smaller isolated patches are observed in the Southern Mahratta country, between it and Hydrabad, viz., at Mudibhal, and Talicota, on the banks of the Bhima, between the city of Gulberga and Firozabad; and also in the vicinity of Digaye, between Muktul and Gulberga.

The sandstone again[1] crops out in the Hydrabad country near Sarapúr, between Hunnumkoondah and Pakkal, to which it continues penetrated by granite.

Beds of limestone occur at Kotah, about ten miles up the Pundeetah river above its confluence with the Godavery.

Identity.—The identity of these scattered beds is proved by their relative geological position with respect to other rocks, their imbedded pebbles, and striking mineralogical resemblance.

Order of Stratification.—The limestone occupies, with few exceptions, the lowest position in the sections afforded by the great lines of drainage of these tracts, and in places where the superincumbent strata have been stripped off.

Next in order of superposition come calcareous shales, mingled with much argillaceous matter, then argillaceous shales and slates, sandstone, siliceous and arenaceous schists, quartz rock and sandstone conglomerates.

In one or two situations I have observed the limestone, where elevated into chains of hills, alternating with sandstone; for instance, between Banaganpilly and Pycut Puspoolah; and near Ryelcherroo in the Cuddapah tract; and also a little south of Kulladghi in the Southern Mahratta tract.

Direction and Dip.—The direction of these beds usually conforms to that of the hypogene schists on which they rest. They have, with the latter, been broken through, penetrated, tilted up, and altered by plutonic rocks. The disturbance is most apparent on the edges of the beds. At a distance from the lines, or *foci* of plutonic action, the beds are found but slightly inclined, and their dip following the easterly and southerly inclination of the great table lands. The Cuddapah strata have been raised at their eastern limits by the elevation of the

---

[1] Dr. Walker, Journal of Asiatic Society of Bengal, 1841, No. 30, p. 471.

Eastern Ghauts with the subjacent hypogene schists, to the average elevation of about 2000 feet above the sea's level; dipping about 40° westerly. They have been similarly lifted by plutonic rocks at their western edge, between Ryelcherroo and Gooty, where the dip is 42° easterly. Intermediate between these axes of elevation the strata are but little inclined. In the tongue of land separating the Toombuddra from the Kistna, the dip of the limestone appears to conform to the undulations of the plain; and is in some mammiform elevations, quâquâversal. On the south bank of the Gutpurba, near its confluence with the Kistna, large masses of the light bluish-grey limestone have been thrown on their edges, and the strata inclined at various angles to the horizon. At Kurnool, the ditch of the fort affords a beautiful section, illustrating the little extent to which disturbance is sometimes carried by plutonic forces. The beds of limestone in the vicinity have but a very slight dip, which in the short space of 500 yards, passes into highly inclined, waving, curved, vertical, and anticlinal, having been broken through by a wedge of hypogene rock (hornblende schist) resting on granite.

Dip of the Sandstone Beds.—The dip of the sandstone when resting on the limestone is usually not so great as that of the latter, or, in other words, unconformable. It may be hence inferred that an interval took place between the deposition of the limestone and sandstone strata, during which the former were disturbed and again tilted up after the deposition of the latter. To strengthen this supposition of two epochs of geological disturbance, it may be added that pebbles of chert and jasper, evidently derived from veins in the limestone, are frequently found in the sandstone conglomerates. The sandstone sometimes rests horizontally on the granite and hypogene schists; but in general it conforms almost to the dip of the latter, as seen in many places in the Eastern Ghauts, north of the Kistna, and in Goomsur, where the dip is generally between 60° and 80°, and inclined to every point of the compass.

Cleavage and Joints.—Joints and planes of cleavage are often strikingly developed in the structure of the more schistose and laminar members of the limestone and sandstone rocks. At Nundaloor, in the Cuddapah district, where the strata have an easterly dip of 12°, the cleavage planes formed an angle of 40° with those of deposition, dipping in an almost similar direction, and preserving far greater regularity and uniformity of dip even over extensive tracts. The lines of deposition are here distinctly marked by alternate parallel light and dark-coloured bands. The joints are at right angles, or nearly so, with the planes of stratification, and often filled or lined with calcareous incrustations. Near Kulladghi, the calcareous slates associated with the limestone sometimes possess a true transverse cleavage, dividing the rock into rhomboids capable of indefinite subdivision into similar forms, at angles of from 30° to 40° with the direction of the strata. The joints here intersect the cleavage at right angles. The true surfaces of deposition may be usually distinguished from the smooth rectilinear planes of cleavage, by their peculiar dimpled aspect. This characteristic is, however, often more or less obscure.

Ripple Marks.—On the exposed surfaces of the sandstone cliffs south of Cuddapah, at Ganjicotta in the Ceded Districts, Gokauk in the Southern Mahratta country, among the ranges between the Kistna and Bagulcota, and various other localities, I have observed distinct ripple marks. Their longitudinal axes, though extremely various, have on the large scale a tendency to an E.N.E. direction, showing that the current which caused them flowed generally in a W.N.W. or in an E.S.E. direction. The marks are not confined to strips or zones of the sandstones, like those of ancient beaches, but extend in every direction over considerable spaces, resembling those on sand constantly under water.

Fissures and Caves.—I have already alluded to the fissures which often cleave the sandstone masses from summit to base. These when numerous and crossing each other at right angles, impart a tesselated appearance to the surfaces of the flat-topped hills. The pebbled surfaces of the conglomerates thus divided are often remarkably level, and reminded me of the artificial pebbled floors found among many of the Roman ruins in Italy. In other situations the fissured surfaces resembled those produced by contraction in drying, in the mud of a tank or river, or in the *Regur*, or black cotton soil. In the sandstone their origin may have been similar, during the consolidation of the rock by plutonic heat. Vertical fissures are also seen in the limestone, though by no means to the same extent: they vary from a few lines in width to many yards. Caverns, so common in the limestone formation of Europe, are rarely seen: a few occur in the Cuddapah beds; some of which, as well as the fissures, I have searched in vain for organic remains. They usually contain incrustations of carbonate of lime, stalactite, kankar, detritus, and angular debris of the rocks forming their sides. Both caverns and fissures are frequently the outlets of springs. The sides of the vaults, though often smooth, do not exhibit the polished or grooved surfaces of attrition; nor can we expect to find such in tracts where the strata are undisturbed.

Parallel furrows and grooves, apparently caused by the action of pebbles moved along by water, are occasionally observed on the surface: particularly on the summit of some limestone cliffs between Banaganpilly and Peapilly, in the Ceded Districts. Rock basins above the present drainage level of the country are rare.

PART III.

Diamond Sandstone, and Limestone.

Lithologic Character of the Limestone.—The limestone passes from a dark blue, or nearly black rock with a smooth, but somewhat earthy, conchoidal fracture, into one of a more compact texture and of a light buff, or cream colour, adapted for lithographic purposes: for instance, some of the varieties near Bagulcota, and Talicota in the Southern Mahratta country; near Kurnool and Ryelcherroo in the Ceded Districts; and Datchopilly in the Nizam's territories. The specimens of these lithographic limestones that have been subjected to actual experiment, though found occasionally to answer, have proved inferior to those of Germany; being often penetrated by minute threads of silex, or calc spar, and not of a sufficiently homogeneous texture. It must be remarked, at the same time, that these localities have not been explored and quarried with adequate care or labour for better specimens, which, it is probable, the lower beds may yield. In structure the limestone is both thick-bedded, and laminar; in colour it is generally of a light bluish grey, though, sometimes, as just observed, nearly black, passing into a variety of beautiful and lively shades of green, yellow, pink, and white; sometimes irregularly disposed, but more frequently in alternating bands, coinciding with the lines of stratification. The green varieties are often spotted with a darker green, or bluish black, assimilating in colour some varieties of serpentine. This latter mineral sometimes occurs in thin strings and nodules in the limestone, and evidently imparts to it much of its colouring matter. These nodules in the vicinity of Kurnool and Ryelcherroo, are usually of a light or siskin green colour, translucent and sectile; streak nearly white. Before the blowpipe they become opaque, redden slightly, and fuse partially on their edges into a white enamel. The variety of limestone imbedding them is often magnesian, and contains asbestus; although the general character of the beds is siliceous and argillaceous, as is evident from the following analysis of an average specimen of the Cuddapah dark blue limestone, made for me by my friend Mr. Macleod, Inspector-General of Hospitals, Madras.

Silex	12	5
Alumina	2	5
Oxide of iron	1	3
Carbonate of lime	33	3
Loss	0	4
	50	0

The chief object of this analysis was to ascertain the origin of the dark colour of this limestone; since, from its whitening before the blowpipe, I had long thought it could not be ascribable to protoxide of iron: the analysis has proved the truth of the conjecture. Mr. Macleod is of opinion that it owes its colour to volatile matter; "extractive." The limestone, in the vicinity of basaltic, plutonic, and hypogene rocks, is usually siliceous, and presents veins of chert, red and brown jasper; sometimes intermingled with films and nests of a mammillary chert, resembling calcedony; and calc spar, as in the vicinity of Kurnool, and Yaripilly east of Gooty. The cherts are usually of a greyish white, translucent, and sometimes of a faint roseate hue; while others resemble carnelian both in colour and texture. In veins and layers, it splits by microscopic fissures into parallelopipedal fragments. The red jaspers are often striped like the limestone with red and green. The limestone frequently graduates insensibly into these cherts and jaspers. A soft reddish and purplish laminar variety of the limestone prevails in the western parts of Kurnool and Cuddapah; and more or less in all the localities where this formation extends, passing by insensible gradations into the ordinary blue limestone of the country. The transition, however, is sometimes so abrupt, as almost to excite the idea of their being a distinct formation: but as yet, this conclusion cannot be arrived at in the absence of organic evidence. These red slaty and shaly beds are frequently interlaminated with thin light green chloritic flakes, which are also seen in the white marbly varieties of the limestones of Bagulcota in the Southern Mahratta country. In the dark varieties thin argillaceous lamellæ occur; which, in decomposition, turn of a light brown hue and become distinctly visible, alternating with the dark blue limestone.

In the vicinity of Bagulcota, Kulladghi, and Kurnool, the limestone acquires so crystalline a structure as to resemble the finer marbles. At Talicota, beautiful dendritic appearances occur inscribed on the successive surfaces of the laminæ, like characters on the leaves of a book, with features so strongly resembling those of vegetation as to induce Dr. Wight the botanist to believe they were organic, though probably the result of metallic infiltration.

The following is the note he sent me on the subject; and, if these appearances be really nothing more than the result of metallic infiltration, it will serve, at least, to show how closely they sometimes mimic the productions of the vegetable kingdom.

"The arborescent appearance in the slate I think an organic remain. At least, I find, when under a high magnifying power, that the black lines can, with the point of a needle, be picked off without touching the stone, as if the carbonaceous matter of the plant was still there. I feel uncertain, however, whether to call the original a *moss* or a *fucus*, but think the latter."

At Chillumcoor, in the Ceded Districts, the limestone is associated with a greyish breccia, having a coarse granular and crystalline structure, resembling that of granite, and imbedding small angular fragments of siliceous slate, and iron pyrites. The line of junction with the ordinary blue limestone could not be traced owing to the thickness of the superincumbent soil.

There are also some beds of a curious rock in the Southern Mahratta country south of Darwar, which, from their insulated position, circumscribed limits, and petrological character it would be premature to give a permanent place to in the formation under description. These beds constitute a hill near the village of Hurti with a mammiform shape, having its surface covered with detached, angular, and rugged masses of a similar rock, which appears to have been subjected to the action of violent disruptive forces. It is of a massive character, rarely laminar, veined with a white opaque quartz, and imbeds crystals of iron pyrites. It is composed of minute angular fragments of a dark glistening quartz, and crystals of pale flesh-coloured felspar, cemented together by a greenish, granular, subcrystalline paste, composed chiefly of carbonate of lime. It is very likely to be mistaken, from the colour, hardness, and granular texture, for a variety of massive siliceous, chlorite rock; and, in some varieties, resembles diallage and serpentine; but on the application of a lens, and, indeed, by the naked eye, its true aggregate character may be distinctly recognised. The application of dilute nitric acid to the rock in substance excites but a feeble effervescence; but from the powder, the extrication of carbonic acid gas is abundantly evident. Some varieties of a dull green hue, are traversed with reddish brown delineations. Before the blowpipe, *per se*, it phosphoresces slightly, and exhibits on the edges points of black shining enamel. The compact varieties are susceptible of a high polish, and are used as an ornamental building stone, which often retains the pyrites bespangling in gold-coloured spots the smooth surface. The minute scales of mica, the crystals of reddish felspar, and dark coloured quartz, together with the general dull green hue of the rock, indicate its detrital origin from the micaceous and chloritic schists with which it is associated. No section presented itself showing the dip of its beds. The crystals of pyrites, not weathering so rapidly as the embedding limestone, frequently stand out from its surface. This is the case with the veins of jasper and chert in the ordinary limestone of Cuddapah, the Southern Mahratta country, &c., exhibiting curious reticulations in relief on their exterior.

Associated Minerals.—The most prominent mineral characteristic of the limestone is the iron pyrites, abounding in nests and cubic crystals; and which, on atmospheric exposure, particularly where subject to moisture, acquire a liver-brown hue. Nests and strings of a poor hæmatitic iron ore are also pretty generally distributed; the former more particularly in the dark blue and green varieties; the latter is sometimes seen filling a succession of small spheroidal and tubular cavities in the substance of the rocks, which are not unfrequently empty; and have possibly originated in bubbles of inclosed air, or gaseous extrication, while the rock was yet in the state of a soft mud.

Galena is found in the limestone near Jungumrazpilly, Bussapur, Mahanandi, and other localities in the Cuddapah district; usually in brown jaspideous calcareous and white quartz veins, associated with iron ore and sulphate of barytes, a mineral hitherto unnoticed by writers on the geology of Southern India, and which occurs in the Nundi Cunnama Pass, over the Eastern Ghauts. Between the layers of the laminar, and more frequently in the argillaceous varieties, thin incrustations of muriate of soda are often found: and I have observed that, where this saline development is greatest, the rock is less solid, has an earthy fracture, and appears to have undergone a chemical change. Selenite is rare: a specimen of this mineral, labelled "Tiagar, southern division of Arcot," occurs in the Museum of the Madras Branch Royal Asiatic Society.

Coal has been discovered by Mr. Walker[1] in the limestone on the north limit of our area at Kotah, about ten miles up the Pundeetah river, above its confluence with the Godavery; where it is described as occurring as a vein in a layer of shale and bituminous shale, in the argillaceous limestone associated with the sandstone, and dipping at a low angle towards the north-east.

---

[1] Journal of Asiatic Society of Bengal, No. 112, 1841, pp. 341, &c.

Organic Remains.—The almost total absence of fossils in this limestone, in Southern India, is a remarkable feature, and renders it impossible to assign it, for the present, a place corresponding with any of the classed formations of Europe or America.

In some of the chert veins in the limestone of Nannoor, in Kurnool, I recently discovered myriads of microscopic, spherical, and oval bodies, resembling at first sight the grains in oolite; but they are larger, and have a more organic appearance, resembling somewhat that of Bohemia. Their section, however, usually gives two or more concentric circles, with a point or nucleus in the centre, which have sometimes a distinctly chambered structure, like that of nummulites. These foraminifera exhibit no traces of carbonate of lime, being entirely silicified. In decomposition they fall out, leaving the surface of the stone so perforated with cavities, as to give it the appearance of coral. Their colour is usually white and opaque: the opacity is evidently caused by disintegration, but in others, translucent, like white carnelian. Those embedded in the red jasper-like chert frequently retain this appearance: some are entirely charged with the red colouring matter, while others have only the outer circles tinged by it.

Lithologic Character of the Sandstone.—The sandstone and its associated beds, lithologically speaking, are not very dissimilar to the Devonian sandstones of England, the finer chloritic slates of which, with their dendritic delineations, find resemblances in those of Chittywaripilly, between Cuddapah and Gooty, in the Budwail, and Cummum Divisions of the Eastern Ghauts, and in the vicinity of Kulladghi, alternating with hard quartzose slates, tilestones, and sandstones. Assimilations to the millstone grit are seen in the coarse white and red sandstones of Badami and Mudibhal in the Southern Mahratta country. In many localities, for instance Banaganpilly, Ryelcherroo, near Bagulcota, and the Juggernaut range of Kurnool, we find breccias and conglomerates passing into red sandstone and quartz rock.

The sandstone-capping portion of the Eastern Ghauts, from Naggery to the Mahanuddi, rarely passes into a breccia, and is seldom associated with the limestone on the more elevated portions of the Ghaut chain. Here it often assimilates the weathered gneiss on which it rests. It frequently passes into red and green argillaceous and siliceous slates, and laminated marls. Beautifully variegated sandstones, exhibiting waving and contorted bands, occur in the vicinity of Sidhout, Cuddapah district.

The sandstone conglomerate of Southern India is most remarkable for being the matrix of the diamond; and it is in absence of organic and other data to class it with any known formation, that it has been deemed convenient, from this almost peculiar mineral feature, to apply to it this temporary distinctive prefix. The diamond occurs both in the sandstone and its interstratified breccias and conglomerates, the pebbles in which are principally quartz, chert, flinty slate, basanite, jasper, and jaspideous clay impregnated with iron, with a few fragments of trap, and the hypogene schists. The pebbles of quartz greatly predominate; and it is worthy of note, that not a single bit of true granite has hitherto been found in these conglomerates. Those of chert, jasper, and indurated clay have evidently been derived principally from the subjacent limestone, and the rest from the hypogene rocks. Fossil chert from the limestone is often found embedded in the diamond breccias of Banaganpilly and of Ramulacota in Kurnool. As the diamond has never been discovered in these subjacent rocks, it cannot be said to exist as a transported crystal or fragment in the sandstone. The pebbles from the hypogene and limestone rocks are both rounded and angular, varying in relative proportions in different localities, and are found from the size of a duck-shot to that of a man's head. They are usually cemented together by an arenaceous paste, more or less fine and compact, mixed with argillaceous matter and oxide of iron. These conglomerates usually rest on the limestone, particularly the beds where the diamond has been found in greatest abundance. In many localities the limestone is entirely wanting, and the conglomerates and sandstone rest immediately on the hypogene strata. Granite, or basaltic dykes are invariably found intruding into diamond areas, of which as a detailed account has already been given, I will not dwell on them here. It may be noticed, *passim*, that in all alluvia in which the diamond is found, pebbles of this formation invariably occur. The most noted diamond localities are in the Cuddapah District, near Condapetta, Lamdoor, Penchetgapadoo, and Ovalumpully, at Banaganpilly, and in Kurnool at Bamulacotta, Devanur, Tandrapaud, and near the Nundi Cunnama Pass, near Gazoopilly; at Munimudgoo, and Wudjra Caroor near Gooty; at Malavilly, a village about sixteen miles W.S.W. from Ellore; at Ganipartata[1], or Partial, Alkur, Burthyenpada, Pertala, Wustapilly, and Codavetty Kalu; at Kattakindapalle, near Bombartipadu, about twenty-four miles northerly from Tripetty. Old diamond pits are also said to exist about forty-six miles west from Ongola, and about twenty miles north from Nellore. Large diamonds have been found from time to time in the bed of the Kistna, below the Moorcondah ferry in Kurnool.

---

[1] Hayne's Tracts, pp. 92 and 110.

Most of the localities just enumerated were formerly within the ancient kingdom of Golconda, but are now under the British Government and the Nizam of Hyderabad. The diamond also occurs in the alluvia of the sandstone districts of the Mahanuddi, the Bramini and Ehee rivers, particularly the latter. There are diamond mines at Wyragurh, ninety miles S.W. of Nagpoor, formerly celebrated, but now nearly deserted.

Muriate of soda and sulphate of alumina occur frequently in thin seams and layers in the purple, reddish, and brownish shales, interstratified with the sandstone of the hills of Gokauk; and I found veins of manganese in the sandstone between the falls of the Gutpurba and Kulladghi.

Iron ores, chiefly magnetic and hæmatitic (specular and micaceous more rarely) are pretty generally distributed in veins with quartz and in nodules; iron pyrites occur less frequently in veins of white quartz.

Cavities filled with fine crystals of quartz, and sometimes embedded in calc spar, occur in the Juggernaut range of Kurnool. In these crystalline nests I observed a few laminæ of a mineral of a bright grass green colour, with a lustre and appearance resembling those of uranite. Galena occurs in the quartz veins of the Nulla Mulla chain and occasional detached strings and thin patches of carbonate of copper.

Anthracite has recently been found in the Goond country in the sandstone of Dantimnapilly, about twenty miles north-west from Jungaum, which is sixty-five miles west from Chinnore. The bed has an extreme breadth of three feet, and length 200 feet. Traces of coal are also said to exist in the diamond sandstone north-west of Nagpore, and it occurs in great abundance in similar rocks in the valley of the Nerbudda, a little further north.

The great intrusion of basalt into diamond areas has already been noticed, and it has usually been accompanied by evidence of heat, viz., induration and silicification of the limestone, fissures, and numerous thermal springs rising up through them, impregnated with carbonic acid. It is possible that this subterranean heat, during its periods of intensity, by acting on the limestone which has been shown to contain volatile vegetable matter, in addition to carbonic acid, drove off a portion of these in a gaseous form, with the superincumbent sandstone, and thus caused its diamondization, if I may be permitted so to express myself, by a process somewhat similar to that of the dolomization of limestone. The atoms of carbon set at liberty from their old combinations of lime, oxygen, and hydrogen, and having little affinity for the silica of their new matrix, gradually aggregated under the influence of certain laws in the pores of the sandstone, and assumed a crystalline form.

Organic Remains.—Although, as already stated, there is a certain degree of mineral resemblance between the sandstone beds of Southe India and those of the Devonian group, yet the singular ichthyolites, molluscs, and corallines that distinguished the latter are totally wanting in the former—that is, as far as has hitherto been ascertained. The sandstones supporting the coal measures at Chirra Punji, resting upon plutonic rocks, hypogene schists, and supposed to be identical with the diamond sandstones of Punna in Bundlecund, of Cuddapah, Kurnool, Banaganpilly, and Nagpore, are said to abound in teredines, and to imbed fossil stems and fruits of Mimosæ, while in its associated limstone, bivalved and univalved shells, with coralloids hitherto unclassed, are found, and a single gryphite[1]; this limestone, however, from its superior position to the sandstone, is probably of more recent origin than that just described.

A few impressions of stems and leaves of plants, one of which resembles a fossil Glossopteris Danæoides of the Burdwan coal-fields figured by Professor Royle, have been discovered by Lieutenant Monro in the Nagpore sandstone. There are two other impressions in Lieutenant Monro's specimens, bearing some resemblance. Mr. Malcolmson thinks, to the large bony scales of the sauroid fishes of the old red sandstone. However, they were so indistinct, that it would not be prudent to indulge in any speculation, until further discoveries be made. One of those impressions, which I carefully examined, bore resemblance to that of the reticulated skeleton of a leaf.

In the sandstone hill of Won, Mr. Malcolmson discovered a fossil of a deep black colour, and having a compact structure, which he conceives to be a portion of a hollow compressed vegetable; its centre is filled with sandstone. The carboniferous sandstones of Damuda, it is well known, contain fossil remains of the Vertebraria Indica, R.; of Sphenophyllum (?) speciosum, R.; of Glossopteris Browniana, Ad. Brongniart; Pustularia Calderiana; Precopteris Lindleyana, &c.

Age.—With regard to the age of the diamond sandstone and limestone, geologists are of conflicting opinions. Christie referred the latter to the transition period, and the former to the old red sandstone, without further evidence than mineral character, and their having been disturbed, with the hypogene schists, by plutonic rocks. Major Franklin[2] has referred the limestone to the lias, and the sandstone to the new red. Mr. Malcolmson[1] has already refuted the opinion of the latter, and states his conviction that they belong to the more ancient secondary, or even transition rocks. Major Franklin's theory appears to have been principally founded on the saliferous seams occurring in the sandstone; but in Southern India, as Mr. Malcolmson justly observes, salt occurs in all the formations, from granite to alluvium, and the blue limestone, classed as lias, almost invariably underlies the sandstone classed as the new red. A large sandstone track in Russia, long supposed identical with the new red, on account of its interstratified gypseous and saliferous beds, has recently been proved by MM. Murchison and Verneuil[2] to belong to the old red, from its imbedded ichthyolites. It is a well-known fact, that the old red in the north of Scotland is saliferous: salt springs occur in the English coal measures, in the lias of Switzerland, in the tertiary limestones of Egypt and Greece, and in the old transition slates of America.

---

[1] Conybeare's Report to British Association, 1832.

[2] Geological Transactions, Second Series, Vol. III., Part I.

The frequent horizontal position of the diamond sandstone and limestone strata must not be regarded as a proof of recent origin. Granite, it is well known, has tilted up, and disturbed rocks of a period more modern than the chalk; while, on the other hand, the distinguished geologists first quoted found the older silurian rocks, covering a considerable portion of Russia, in perfectly horizontal stratification. Until the further discovery of organic remains enables the geologist to see his way more clearly, it would be advisable to refrain from any hasty and premature classification.

With respect to their age, relatively to other Indian rocks, it has been clearly shown, from superposition, unconformability of stratification, and imbedded pebbles, that they are posterior to the oldest hypogene schists, and anterior to the latest outbreaks of granite and basaltic greenstone, which have penetrated and altered their structure. A few pebbles of an older greenstone occasionally occur imbedded. I have already stated my opinion of an interval having taken place between the deposition of the limestone and the sandstone sufficient for the consolidation of the former, from the fact of a slight unconformability of dip, and of the latter's containing imbedded pebbles of a fossiliferous chert evidently derived from the limestone.

---

[1] Geological Transactions, Second Series, Vol. V., pp. 568, 569.

[2] Ibid. Ibid. Vol. V., Report of Buckland's Anniversary Speech, 1841.

[*To be Continued.*]

Art. VIII.—*A few Observations on the Temple of Somnath;* by Captain Postans.

[*Read June* 15, 1844.]

As a strong feeling has been evinced by the Society that by means of graphic illustration the curiosities and monuments of antiquity in India should be rescued from oblivion, (a wish that has been most liberally met by the Honourable Company,) I have considered it somewhat conducive to the object in view to print the sketch which I took of the celebrated temple of Somnath during my visit to Girnar in 1838*, and of which a description was given in the Royal Asiatic Society's Journal for October, in that year.

The principal historical notices of Somnath which have reached us are comprised in the well-known accounts of Mirkhond, (in his Rozat-as-safá,) Firishtah, in his great History, and a curious and quaint story of the poet Sadi's visit to the temple, about two centuries after the invasion of the Saurashtra by Mahmúd of Ghazni. From these, as well as collateral accounts, it is certain, notwithstanding a great discrepancy as to the peculiar form of the idol or object of adoration which Mahmúd found on his visit in the beginning of the eleventh century of our era, that the temple of Somnath was one of the richest and most gorgeous shrines then existing in Western India, and that this wealth and renown formed no little portion of the inducements which influenced the Mohammedan march to that extreme corner of the Gujarat peninsula. Like everything of an historical character in India, the Hindús themselves are totally ignorant respecting the interest which attaches to Somnath, and certainly in and near the spot, the fact of Mahmúd's invasion, startling though it was, is quite unknown, and the building itself looked upon in its ruined state without the slightest approach to respect or interest of any kind. How far this apathy may extend into the interior of India I am not prepared to state, but certainly in no part of the Bombay Presidency, or amongst the Rajput tribes of Saurashtra, did I ever hear a syllable indicative of an acquaintance with an interest in the Somnath, except amongst the Jain priests of Girnar, who in their crude historical records designate it as *Chandra prabasa*, and appear to consider it as one of their shrines; but of its political history they know nothing. The vicinity has shared the veneration of pilgrims (with the neighbouring shrine of Dwarkanath and the whole line of coast,) from the legend which ascribes the death of *Krishna* from the arrow of his brother *Vali*, to a spot near Somnath, but to the temple itself they pay no respect. In an Upapurana it is mentioned as one of the twelve Lingas of Siva, and hence a great difference of opinion between learned commentators as to the Budhistical or Brahmanical character which should be assigned to the place when found and pillaged by Mahmúd: the able discussions on this point printed in the Asiatic Journal for May and June, 1843, must be referred to for every information on this head; it would ill become a mere observer and recorder of facts like myself to offer any opinion on so erudite a question; but as my impressions were given in 1838, so I venture to refer to them here, and will conclude this notice with the description I then gave of the actual appearance of the temple. Colonel Tod has quoted inscriptions found in the neighbourhood of Somnath, some of which I saw, and which appear to record repairs or additions made to the temple by petty princes or chiefs of Anthilwara; and the modern temple raised by Ahalia Bhye, near the ruin of the greater, is rather a proof that the Mahrattas considered the neighbourhood imbued with a certain degree of sanctity, as it certainly is to Hindús, than that they attached any interest to Somnath itself.

---

* Published by Messrs. Smith and Elder, Cornhill.

Pattan, and all the part of the country wherein it is situated, is now under a Mohamedan ruler, the Nawaub of Junagurh, and the city itself offers the most curious specimen of any I have ever seen of its original Hindú character, preserved throughout its walls, gates, and buildings, despite Mohammedan innovations and a studied attempt to obliterate the traces of paganism; even the very musjíds, which are here and there encountered in the town, have been raised by materials from the sacred edifices of the conquered, or, as it is said by the historians of Sindh, " the true believers turned the temples of the idol worshippers into places of prayer." Old Pattan is to this day a Hindú city in all but its inhabitants—perhaps one of the most interesting historical spots in Western India. Mahmúd, we know, left a Hindú or a native ruler here, but successive changes have taken place since then, and various historians mention spoliations and conversions of the temples to mosques by succeeding conquerors, until Somnath assumed the appearance it now presents, of a temple evidently of pagan original altered by the introduction of a Mohammedan style of architecture in various portions, but leaving its general plan and minor features unmolested. Whether any or what portion of the original structure now stands as it was seen by Mahmúd in the eleventh century, I would beg to leave to more learned commentators to decide; I can only say, that in various portions, particularly the western front, where it is most perfect, it is rich in ornament, and by whomever raised or restored, the work must have been done at a period when zeal and wealth prompted the labour. Its material altogether is cyclopean, and even in its present state would, unless wilfully demolished, stand for centuries, though exposed to the trying effects of damp sea air, and for some portion of the year to the whole violence of the monsoon. I would here express a hope that it may long be allowed to stand as a remarkable monument of Indian history, replete with an interest of which its total or partial former demolition cannot deprive it. It can never be again used for the purposes to which it has heretofore been appropriated; and any slight efforts for its preservation could not, therefore, be misconstrued.

The following is the translation of an inscription in the Cufic character, transcribed by Major Rawlinson, which was found on the reputed gates of Somnath, brought, in 1843, by our victorious troops from the tomb of the champion of the faith at Ghazni.—"*In the name of the most merciful God* (may there be) *forgiveness from God for the most noble Ameer the great King, who was born to become the Lord of the State, and the Lord of religion, Abdúl Kassim Mahmúd, the son of Sabuktagin, may the mercy of God be upon him,*" (remaining phrase illegible.) A sketch of these gates has, I believe, been published, but it is curious to observe, whatever may have been their architectural character or material, as applicable to Somnath, whence vague tradition has assigned their removal, that there is no allusion to the exploit in the above, unless the illegible phrase may contain it.

The following is the description of the appearance of Somnath, which I have elsewhere ventured to describe with pen and pencil.

"This famous shrine occupies an elevated site in the north-western corner of the city of Puttan, on the western coast of the Gujarat peninsula, overlooking the sea and close to the walls. In its present mutilated state it may be difficult to convey any very distinct or correct idea of *Somnath*, for though its original design and gorgeous architecture may still be traced even in the complete ruin it presents, its general effect is likely to be better understood from an effort of the pencil than the pen.

"The temple consists of one large hall in an oblong form, from one end of which proceeds a small square chamber, or sanctum. The centre of the hall is occupied by a noble dome over an octagon of eight arches; the remainder of the roof terraced and supported by numerous pillars. There are three entrances. The sides of the building face to the cardinal points, and the principal entrance appears to be on the eastern side, (the view is taken from this quarter.) These doorways are unusually high and wide, in the Pyramidal or Egyptian form, decreasing towards the top; they add much to the effect of the building. Internally, the whole presents a scene of complete destruction; the pavement is everywhere covered with heaps of stones and rubbish; the facings of the walls, capitals of the pillars,-in short, every portion possessing anything approaching to ornament, having been defaced or removed, (if not by Mahmúd, by those who subsequently converted this temple into its present semi-Mohammedan appearance). On a pillar beyond the centre arch, and leading to the sanctum, is an inscription which, anxious as I was to learn anything connected with the temple, much excited my curiosity. On translation, however, it proved to be merely a record of a certain *Selát* or mason, who visited the place some 300 years since. I learnt, to my inexpressible regret, that an ancient tablet, whose unoccupied niche was pointed out to me, had been removed from Somnath some years ago by a European visitor. I need hardly quote Col. Tod's remark on this mistaken, though I fear too frequent practice; but if what he says be applicable to the mere architectural ornaments of a building, how much more so to engraven records similar to that which is here wanting.

" Externally the whole of the buildings are most elaborately carved and ornamented with figures, single and in groups of various dimensions. Many of them appear to have been of some size; but so laboriously was the work of mutilation carried on here, that of the larger figures scarcely a trunk has been left, whilst few even of the most minute remain uninjured. The western side is the most perfect: here the pillars and ornaments are in excellent preservation. The front entrance is ornamented with a portico, and surmounted by two slender minarets —ornaments so much in the Mohammedan style, that they, as well as the domes, have evidently been added to the original building. The two side entrances, which are at some height from the ground, were gained by flights of steps: of these latter the remains only are to be traced. The whole space, for a considerable distance around the temple, is occupied by portions of pillars, stones, and fragments of the original building."

Such is a brief description of the present appearance of the renowned *Somnath*, which, notwithstanding its original spoliation and subsequent alterations, must always prove an object of great interest to all who have studied the history or antiquities of India. I must not omit to mention, as a proof of the wonderful solidity of this structure, that within a few years its roof was used as a battery for some heavy pieces of ordnance, with which the neighbouring port of Virawal was defended from the pirates who previously infested the coast.

Art. IX.—*Report on some of the Rights, Privileges, and Usages of the Hill Population in Meywar; by* Captain W. Hunter, *of the Meywar Bhíl Corps.*

[*Read February* 25, 1843.]

Respective Rights of Sovereign Chiefs and Subjects on the Hilly Tract between Sirohi and Doongurpore.

This question appears to have been first seriously agitated in 1826, in consequence of a reference from the Acting Political Agent in Meywar, Capt. Sutherland, to Sir C. Metcalfe, regarding certain Grasya chiefs of the Hill principalities, nominally independent, but from whom allegiance was claimed by the Oodeypore Government.

In reply to the above reference, Sir C. Metcalfe expressed himself of opinion that those chiefs whom he found independent when our mediation was established in this part of India, and who might be able to show that they had not for a considerable period prior to our mediation acknowledged submission to any power, should be recognised as still independent; and that in that case we ought not to lend our aid to reduce them: this was the general principle established by Sir Charles Metcalfe, upon which to regulate our conduct towards these states; but for a more particular solution of the question in each case, the Political Agent at Oodeypore was desired to have recourse to an investigation of the claims to allegiance set up on the one hand, and of the grounds of denial on the other.

Consequent on these instructions, Capt. Cobbe, in the course of conversation with the Minister of Rana Bheem Sing, endeavoured to ascertain whether, within the period of his Highness's existence, any chout, tunkhwah, or other tributary payment, had been made to the durbar by the chiefs of the Grasya tribes of Joora, Meerpoor, Oguna, and Panurwa, and whether any engagements of the kind had existed during the same period.

The Minister's answer was such as to satisfy Capt. Cobbe that the claims of the Rana to supremacy over these chiefs had been in abeyance for a period far exceeding the term adverted to. The Rana Bheem Sing disavowed the collection of any revenue from them during his long reign of nearly half a century, and admitted that during that period the Grasya chiefs had never voluntarily afforded, nor had he been able to enforce any service or tribute from them. Capt. Cobbe therefore considered that the Oodeypore chief had failed in substantiating a claim to supremacy over the chiefs of Joora, Meerpoor, Oguna, and Panurwa; and that, on the principles laid down in Sir Charles Metcalfe's letter of instructions under date 9th December, 1826, the independence of these chiefs was indisputably established.

Assuming this point to be fully settled, the next subject of consideration was what course it might be prudent and necessary to adopt to oblige these chiefs to afford protection to travellers against the violence and outrage of those over whom they claimed unqualified jurisdiction, and to induce them, whilst respecting the rights of their neighbours, to afford every encouragement to the cultivation of such resources as they possessed within the limits of their respective territories.

Capt. Cobbe, in consequence of the poverty and weakness to which these chiefs had been reduced by a long period of anarchy and confusion, recommended that to carry these views into execution, some assistance should be afforded them by the British Government, more especially as in their unsettled and disorganised state, if left to themselves, they were avowedly and manifestly unable to control their subjects, or to obtain from them anything more than a scanty and uncertain income, granted rather to hereditary claims than exacted by the power of the chiefs.

In common cases of real or pretended inability on the part of the chiefs to repress the outrages and aggressions of their subjects, the power to whom the general tranquillity is confided, Capt. Cobbe argued, was entitled to assume the management of the estate; and though, owing to the extreme poverty of the country, such an assumption would in all probability prove anything but profitable to the paramount power, still, from the position of the states bordering on Edur, Gujarat, Sirohi, and Palhanpore, it was, in Capt. Cobbe's opinion, of the highest importance that such arrangements should be adopted by the British Government as would effectually insure the suppression of the constant predatory irruptions of the Bhíls, and oblige the chiefs themselves to refrain from committing aggressions on the neighbouring principalities.

In reply to these observations, Sir Charles Metcalfe, in a letter dated 18th December, 1826, remarked, that as the Grasya chiefs were independent, and did not acknowledge allegiance to Oodeypore, or any other state, it would be necessary to negotiate with them on our part: that it did not, however, appear to him that the chiefs in question had any claim to our assistance, and that they were not even entitled to our protection: that we required nothing from them but the security of our own subjects and allies against the predatory irruptions of the people over whom they professed to have sovereignty, and a safe passage through their territories for travellers and merchandise.

The first of these demands, if not both, Sir Charles observes, we are entitled to, and even bound, in justice to others, to insist on; and should the chiefs be unable to give us satisfaction on that point, we have an unquestionable right, in defence of our subjects and allies, to subjugate the country of the offenders.

Such Sir Charles Metcalfe conceived to be the proper and only principles of any negotiation to be opened with these chiefs. "We hereby," he says, "ask nothing but what we have a right to require: if, therefore, they withhold it, they become public enemies: if they be unable to effect it, they virtually abdicate the sovereignty to which they pretend over all whom they cannot restrain from outrage."

In conformity with these principles, Sir Charles recommended that the Grasya chiefs should be called on to state distinctly what portion of territory they could be responsible for, and what portion was beyond the exercise of their efficient sovereignty. He did not think it desirable that the expectation of assistance should be encouraged, but in the event of their soliciting it, they were to be called on to state in what particulars, and for what purposes, it would be wanted; as also what equivalent they might be prepared to pay for assistance which they could not in equity expect gratuitously.

On the above principles, as far as they could be acted upon without involving a violation of any manifest rights appertaining to the Rana of Oodeypore, Capt. Cobbe was authorised to enter into negotiations with the Grasya chiefs, himself directly, or to entrust the business to Capt. Black as a part of the duties of a deputation on which he was about to be employed under the orders of the Political Agent.

Capt. Black proceeded towards the Hills in January, 1827, but unfortunately owing to the rebellion of the celebrated Dowlut Singh, the manager of Jowass, all his efforts to overcome the disaffection of the Grasya chiefs proved unavailing, and nothing was accomplished till the cold weather of 1828, when Capt. Speirs, supported by a force of upwards of 2000 of our own men from Neemuch, under the command of the present Major-General Burgh, succeeded in persuading Dowlut Singh, together with the chiefs of Joora, Oguna, and Panurwa, to render their submission, and to acknowledge the supremacy of the British Government.

The claims of the Grasya chiefs to independence were at this period fully established on the principles laid down in Sir Charles Metcalfe's instructions, and the justice of a claim thus recognised by the Governor-General's Agent for the affairs of Rajpootana, and afterwards ratified by the Supreme Government, would seem to be supported by the authority of Capt. Tod, who, in regard to the states under discussion, remarks as follows:—

"The principalities of Oguna, Panurwa, and Meerpoor, are inhabited by communities of the aboriginal races, living in a state of primeval and almost savage independence, owning no paramount power, paying no tribute, but with all the simplicity of Republics[1]." "Oguna Panora is the sole spot in India which enjoys a state of natural freedom; attached to no state; having no foreign communications; living under its own patriarchal head, its chief, with the title of Rana, whom one thousand hamlets scattered over the forest-crowned valleys obey, can if requisite appear at the head of 5000 bows. He is a Bhoomia Bhíl of mixed blood, from the Solanki Rajpoot on the old stock of pure (oojla) Bhíls[2]." "The descendants of Baleo and Deeva, the Oguna and Oondree Bhíls, celebrated as the faithful guardians and companions of the fugitive Bappa Rawut, the great ancestor of the Oodeypore royal family, still claim the privilege of performing the teeka on the inauguration of a new sovereign, on which occasion, besides making the teeka of blood drawn from the finger of a Bhíl, the Oguna chief is entitled to take the prince by the arm, and seat him on the throne[3]."

Though the Rana of Panurwa disclaims the feudal supremacy of the Rana, owing to the long time it has been in abeyance, as well as on account of the uncertain and indefinite nature of such claim when it has been temporarily recognised, still he acknowledges to Capt. Speirs that his ancestors, many generations back, had a certain gate in the Hills entrusted to their charge, where they were bound to keep up a stipulated number of horse and foot, and for the performance of this duty the Rana of Oodeypore bestowed upon them several villages. These villages at a subsequent period having been resumed, the above service was discontinued, and their dependent condition again wholly disappeared.

The Oguna Rawut is a younger branch of the Panurwa family, and acknowledges the supremacy of its chiefs. No member of the Oguna house can take his seat on the Gaddí till placed therein by the chief of Panurwa, who girds on his sword, and receives the usual fine of investure. Whether any engagements have been entered into subsequent to the treaties settled by Capt. Speirs in 1828, I have not had the means of ascertaining.

---

[1] Tod, Vol. I., p. 10.
[2] Ibid. p. 224.
Ibid.

The valley in which Joora is situated, as also the villages of Oguna and Panurwa, extends from north to south about fifteen coss, varying in breadth from five miles to three and two. The population is considerable, and the soil extremely fertile, producing as fine fields of wheat and barley as are to be seen in any part of India. The inhabitants cultivate the sugar-cane and ginger, and many valuable drugs used by native physicians are also produced on these Hills. The chiefs themselves are said to derive little benefit from all these advantages, their share of the revenue or produce being very much in the proportion to the power they possess of exacting them from their subjects, the more powerful of whom have been in the habit of giving what they do, more as a benefaction to the chiefs, than from any acknowledged or inherent right on their part to enforce it.

The country is by nature exceedingly strong, and the difficulty attending military operations is much enhanced by the great scarcity of water, the absence of every species of cattle and carriage, and the difficulty of procuring supplies and information. March and April are perhaps the most favourable months for military operations, when, in consequence of the scarcity of water in the Hills, the Bhíls and their cattle are compelled to descend to the valleys; and on these occasions they are easily surrounded; but this, owing to the scattered site of their hamlets, is very difficult, if not impossible, to accomplish when they once get to their Hills. Nothing alarms the Bhíls more than the probable loss of the Indian corn, or Kharíf crop, which is cultivated during the rains, and on which they chiefly subsist. Their dread on this score has often induced the rebellious Bhíls to surrender, and to give hostages or security for future good conduct, when all other means have failed to reduce them to subjection.

In the Grasya Hills, as well as in the Jowass District, there exist numerous petty chiefs of the same caste as, and acknowledged by the population; which, with the exception of a few Baniyas in the principal villages of each chief, consists almost entirely of Bhíls and Grasyas. The whole body of the governed are there naturally connected with their rulers; and were these only more solicitous of the public welfare, and more disposed to exert themselves, their influence and power would no doubt avail much to suppress the indefensible outrages so frequently committed by their turbulent and unruly subjects.

In Chupan and Doongurpore the relations between chief and subject are on a very different footing. In those tracts, no chief of

Bhíl or Mína extraction is to be found. The people have there been for ages in partial subjection to the Rajpoot chiefs, between whom and the Bhíl no bond of union or attachment, except that of community of crime, ever appears to have existed. Moreover, owing to the constant residence of these chiefs on their estates, the population in that quarter has naturally become very mixed—so much so, that in some parts of Chupan, it is supposed that the Bhíls are outnumbered by the other classes of inhabitants,—Rajpoots, Baniyas, artisans, traders, &c.

Amongst the tribes which had made themselves particularly conspicuous by their predatory habits in these Hills are the Moghías. They are mercenary foot soldiers, usually armed with tulwars and matchlocks. They have the reputation of being a bold, hardy, and enterprising, but very debauched race: trained to plunder and fatigue, and at all times willing to sell their services to the highest bidder. They are originally from Joudpore, whence they were expelled about seventy years ago by Raja Bajee Sing. They eat every kind of flesh, even to the cow and jackal, and are sadly addicted to strong liquors. Their Jamadars or leaders, whom they obey implicitly, are usually mounted, and, like most Hindus, they have the reputation of being true to their salt, or employers, but never fail to return to their plundering habits the moment they are released from service.

A strong party of Moghías, under the orders of their leader Humauth, were in the service of Dowlut Singh, the Manager of Jowass, during the period he was in rebellion in 1827-28. In April 1828, information was received of the death of Humauth, in a plundering expedition he made into Gujarat. He had long been one of the most dangerous and turbulent characters in this quarter, and had, on various occasions, given much trouble to the Government officers.

GENERAL REMARKS REGARDING THE BHIL TRIBES.

The fabulous traditions of the Hindus have supplied us with the following extravagant account of the origin of the Bhíls. Mahadeo, when sick, was one day reclining in a forest, when a beautiful damsel appeared, the first sight of whom effected a complete cure of all his complaints. The result of this interview was the birth of many children, one of whom, distinguished for his ugliness, slew the favourite bull of Mahadeo, for which crime he was expelled to the woods and mountains; and his descendants have ever since been stigmatised with the names of Bhíl and Ushaster, or Outcast.

The Bhíls, it has been remarked, have ever been considered a degraded race, the very refuse of society; and the estrangement and despair which such a notion is sure to generate, whilst it tends to cut off all those more kindly and humane feelings which, in other classes of even the Indian community are generated between man and man, naturally prompts them to acts of outrage against their fellow-creatures, and reconciles them to those habits of rapine and plunder which their traditions teach them they were created to follow, and which for ages have rendered them a scourge to society.

Without any fellow-feeling for the rest of the community, who hold them so low and so degraded, with such an impression as to their destiny from their birth, inured to hardships, especially to live in the open air, and to the use of arms, and caring little for a life which, under the most favourable circumstances, affords few comforts and little gratification beyond that enjoyed by the brute; the course of reckless violence, and wanton cruelty they have always pursued cannot excite much astonishment.

The Bhíls are usually divided into two classes,—the village or the cultivating, and the wild or Mountain Bhíls. They generally, however, preserve the same usages, and the same forms of religion; but in those parts of the country where the Bhíls appear more humane and less reckless of their own and others' lives, it has generally been found that they are not so destitute of the means of existence; and that in proportion to the abundance, or otherwise, of these essentials, they are generally more or less disposed to live in peace and quietness.

A vicinity to the Hills in every country has invariably been found favourable to the systematic aggressions of plundering tribes possessing retreats among fastnesses of mountains and extensive jungles; and to repress the outrages of such local banditti has at all times proved a task of no common labour and difficulty. It has been very justly remarked, that it is no reflection on the irresistible nature of the power and policy of the Indian Government, that we have not succeeded at once in this object. In more civilized countries, in Greece, Spain, and Italy, the best efforts of Government have failed in effecting the extirpation of such illegal communities; and even England does not consider herself disgraced, notwithstanding all the efforts of her navy, —all the activity and discipline of her trained bands and military on shore, have been ineffectual to put down the system of smuggling.

We can therefore but too well conceive that among clans such as the Bhíls, plunged as they are in the grossest and most debasing ignorance; unshackled by any laws; in many parts of the country recognising no Government; and accustomed to set every principle but that of violence at defiance, it must prove a very difficult and delicate task, even by the application of the wisest and gentlest measures, to replace with the forbearance of civilized life, that desire for feud, and that lust for unlawful possession which is common to all barbarous tribes. Plunder, to a Bhíl, has hitherto been the charm of his existence: plundering they designate *shikar*, sport; and the prospect of driving off a few bullocks, possessing themselves of the property of travellers, or of a field of ripe grain, has hitherto, in the estimation of these strange people, been found to outweigh all the advantages which have at different times been held out to them by the offer of regular employment. I trust, however, that in the disinterested experiment which, under the authority of the British Government, is now being made to ameliorate their moral and physical condition, we are in a fair way to establish a better order of things. The mild and humanizing spirit of these measures, aided by the cementing influence of good and regular pay, can hardly fail to produce the usual effects in this quarter; and after the several Bhíl corps shall have been successfully organized, as we gradually succeed in bending the people to our sway, by giving a new aim, character, and interest to their existence, as we gradually succeed in soothing their exasperated passions, and in awakening them to habits of discipline, industry, and sobriety, we may hope to obtain a very powerful pledge against future irruption, and that constant disturbance of the public tranquillity which has hitherto been the bane of this misgoverned country.

That the Bhíls in this tract, by long giving license to the most lawless and predatory habits, should have rendered themselves obnoxious to the severest penalties, can hardly excite surprise, when we reflect on the moral and political disorganization—I may say, the almost irremediable confusion of every portion of the Rana's dominions at the period of our mediation. Captain Cobbe, in adverting to this lamentable subject, does not hesitate to affirm that, in his time, from the prince to the peasant, all were thieves and robbers throughout the province; and remarks, there is no security for person or property. The Government is a tissue of cheating and oppression, without even the semblance of law and justice; and its influence and example are but too glaringly manifest in the shocking depravity and demoralization of all classes of the people.

Thus the Bhíls and Grasyas, occupying the tract between Sirohi and Doongurpore, as also those in Chupan, have at one time been encouraged to the commission of outrage by the example of those whom they have been accustomed to recognise as their chiefs, and to whom they have been obliged to surrender a portion of the fruits of depredations. At other times, they have been goaded into rebellion by the violent and oppressive administration of the Rana's Kamdars, as well as by the overbearing, and often cruel conduct of the irregular troops which, under the control of those state harpies, have been stationed at the different *thannas* to enforce the orders of the Durbar.

Another cause of the violent and vindictive spirit which has occasionally hitherto exhibited itself amongst the Bhíl population, may be traced to the attempts on the part of the Durbar to deprive the Bhíls of the privileges of levying rakhwalee, or black-mail, on travellers and merchandize. The Bhíls have the reputation of being particularly tenacious regarding this privilege; and hitherto any attempt to abolish it has been productive only of disastrous consequences. When their dues are paid the Bhíls seldom commit depredations: when withheld, no native power has yet been able to coerce them. Travellers and merchants pass through their Hills without molestation or interference, after paying the usual tax, and property under their charge is rarely plundered or touched. On the other hand, if any attempt be rashly made by travellers to force a passage without paying the dues, they are certain to be pillaged. Thousands of these warlike spirits, as their war-scream is re-echoed from hill to hill, will immediately collect from every hamlet in the neighbourhood to resist this, or any other innovation.

PRIVILEGES, CUSTOMS, AND HABITS OF THE BHILS, MORE PARTICULARLY THOSE INHABITING KURRUCK, KHAIRWARRA, AND THE HILLY PORTION OF CHUPAN BETWEEN DOONGARPORE AND OODEYPOOR.

As I have before observed, one of the most important privileges to which the Bhíls lay claim, is a right to levy a tax denominated indifferently rakhwalee, chowkee, and bolaee, on all travellers and traders passing through their country, in return for which they are responsible for their safety and protection. The sum paid on these occasions appears never to have been exactly defined: it varies in different parts of the country, and has sometimes been regulated by the known or supposed wealth of the parties.

When the Rajpoot chief was powerful enough to keep the Bhíl population in due subjection, this tax was levied by him directly, either at the borders of his district, or in the town where he resided: but such Bhil Pals as did not acknowledge obedience to the Rajpoot chief (though nominally his dependants), assumed the right of enforcing the above tax on their own account; and this custom now obtains over a great portion of the Hill Districts.

In addition to the above tax, the Chief has been in the habit of exacting customs on all grain and merchandize passing through his districts; as also the Mafra, which is a tax on all produce taken from one village to another within the district.

The Bhíls of powerful Pals, who are in the habit of plundering the villages in Meywar, Doongarpore, Pertabghur, Sedur, &c., frequently enter into engagements with certain Ryot villages to receive chowkee or rakhwalee. By this arrangement the Bhíls are secured a certain quantity of grain, or a specified number of cattle from the village, in return for which they are under an engagement, not only to abstain from the future plunder of its inhabitants, but likewise to afford them protection against the depredations of others. This protection is not secured on all occasions by the Bhíls keeping a watch for the protection of the Ryots, but by the power which the Bhíls receiving the rakhwalee possess of attacking and forcing the members of any other Pal to make restitution of all property plundered from the village under their guardianship. The Ryot villages, however, have sometimes been under the necessity of paying two or more Pals for this protection; and in addition to the above tax, the Ryot villages often give a quarter of their crops to the Rajpoot chiefs, either in money or kind; provide also for the maintenance of a certain number of horses; pay a fine for the marriage of any individual of the family; supply funds for the repair of the Chief's house, wells, &c., and are, besides, subject to other compulsory fines.

The Rajpoot chiefs also claim a fourth of the agricultural produce of the Bhíl Pals; but this is seldom paid in kind by any of the Bhíl communities, excepting those in the immediate vicinity of the Chief's residence. The sum claimed in lieu thereof it has been usual to discharge every two or three years from a portion of the cattle they for that purpose may have driven from the adjoining states. Frequently, however, in order to obtain his dues, the Chief has himself been obliged to attack the rebellious Pals; on which occasion everything his followers can lay hands upon is seized and carried off: but women, children, and cattle are generally restored, on the payment of a sum of money, amounting to about five rupees per head. A certain portion of all property, such as money, jewels, cloths, captured by the Bhíls is also claimed by the Chief, who, in some instances, has with his followers been known to accompany the marauding parties.

In the year 1818, in consequence of the alliance of Meywar with the British Government, the Rajpoot Chiefs having been summoned to the Durbar by Captain Todd, they were induced to submit to His Highness; who, on redeeming that portion of the Khalisa-lands which had been forcibly usurped, and granting them sunnuds for their original estates, thought fit to prohibit these chiefs from exacting the rakhwalee and tax which had only been submitted to by the Khalisa villages in consequence of the inability of the Rana's government to afford them the protection to which they are entitled.

The engagements entered into between the Rana and his chiefs, on the above occasion, are detailed in the following treaty:—

Charter given by the Rana of Meywar, accepted and signed by his Chiefs, defining the duties of the Contracting Parties, A.D. 1818.

Seid Sree Maha Rana Dheroj, Maha Rana Bheem Sing, to all the Nobles my brothers and Kin, Rajas, Patels, Jhalas, Chohans, Chondawuts, Pawars, Sarangdests, Suktawuts, Rahtores, Rawuts, &c., &c. Now, since Samvat 1822 (A.D. 1776) during the reign of Sree Wur Singh-ji, when the troubles commenced, laying ancient usages aside, undue usurpations of the land have been made; therefore on this day Bysakh Badi 14, Samvat 1874 (A.D. 1818) the Maha Rana assembling all his chiefs, lays down the path of duty in new ordinances.

1. All lands belonging to the Crown obtained since the troubles, and all lands seized by one chief from another, shall be restored.

2. All Rakhwalee, Bhoom, Sagat (dues) established since the troubles, shall be renounced.

3. Dhan Bisioo (transit duties) the right of the Crown alone, shall be renounced.

4. No chiefs shall commit thefts or violence within the boundaries of their states. They shall entertain no Thugs, foreign thieves, or thieves of the country, as Mogees, Baories, Shories; those who shall adopt peaceful habits may remain, but should any return to their old pursuits, their heads shall instantly be taken off. All property stolen shall be made good by the proprietor of the estate within the limits of which it is plundered.

5. Home or foreign merchants, traders, kafilas, brinjarries, who enter the country, shall be protected: in no wise shall they be molested or injured; and whoever breaks this ordinance, his estates shall be confiscated.

6. According to command, at home or abroad, service must be performed. Four divisions (Chokies) shall be formed of the chiefs, and each division shall remain three months in attendance at Court, when they shall be dismissed to their estates. Once a-year, on the

festival of the Dussera, all the chiefs shall assemble with their quotas, ten days previous thereto, and twenty days subsequent they shall be dismissed. On urgent occasions, and whenever their services are required, they shall repair to the Presence.

7. Every Pattawut holding a separate patta from the Presence, shall perform separate service. They shall not unite or serve under the greater pattawuts; and the subvassals of all such chiefs shall remain with and serve their immediate Pattawuts[1].

8. The Maha Rana shall maintain the dignities due to each chief according to his degree.

9. The Ryots shall not be oppressed: there shall be no new exactions or arbitrary fines: this is ordained.

10. What has been executed by Thocoor Ajeet Sing and sanctioned by the Rana, to this all shall agree[2].

11. Whoever shall depart from the foregoing the Maha Rana shall punish: in doing so the fault will not be the Rana's; whoever fails, on him be the oath (án[3]) of Eklinga, and the Maharana.

The result of the above arrangement, though not effected without much ill-blood, as was to be expected when so many conflicting interests were to be reconciled, was a temporary move towards peace and repose. But it was of short duration. Several of the turbulent chiefs, who, under various pretences had on the above occasion declined attending the durbar, continued to enforce the collection of the rakhwalee, or, in the event of non-payment, to plunder the villages; and as the chiefs who tendered their submission declared their incompetency to restrain their Bhíls, the country was soon thrown back into a state of anarchy; and to so dangerous extent as to render it expedient to aid the government of Meywar by the employment of a British Force.

The Bhíls, by these measures reduced to submission, and having entered into written engagements to deliver up all their arms, and to abstain from plunder, and from the exaction of rakhwalee, were in the first instance placed under the immediate control of his Highness' officers.

Shortly after this arrangement the greater portion of the Bhíl Pals were restored by the Rana to the Rajpoot chiefs, on their promising to be answerable for the conduct of the Bhíls, as well as for the protection of travellers and traders. It was very soon, however, apparent that the Rajpoot chiefs were neither willing nor able to fulfil their engagements; and several who were notoriously disaffected to the Rana's cause, hesitated not to aid in openly obstructing the measures of government. These circumstances, combined with the frequent defeats which the Rana's troops sustained from the rebel Dowlut Singh and his Bhíls, gave great confidence to the latter; the result of which was the re-establishment of the rakhwalee system on its former footing; when all traders and travellers refusing to pay his compulsory tax were invariably plundered, and sometimes murdered.

---

[1] This Article has become especially necessary, as the inferior chiefs, particularly those of the third class, had amalgamated themselves with the head of the clans, to whom they had become more accountable than to their prince.

[2] This alludes to the treaty which the chief has formed, as Ambassador to the Rana, with the British Government.

[3] *An*, oath of allegiance. Tod, Vol. I., p. 172.

In 1828, notwithstanding the Bhíls were again reduced to submission by the force under the orders of Capt. Speirs, the abolition of the rakhwalee tax does not on that occasion appear to have been insisted on; and the system is now in force not only along the whole line of road between Oodeypore and Doongurpore, but I believe obtains in most parts of these hilly tracts. In bad seasons, it appears to be almost the only means the Bhíls have of supporting themselves without plunder; and, accordingly, as I have before observed, to deprive them of this privilege only tends to excite the flame we would wish to extinguish, and to render the Bhíls more intractable, and more determined to set the authority of their sovereign at defiance. In return for this tax the traveller is furnished with a guide and protection, the Pal in the receipt of the bolaee becoming accountable for any loss.

Appearance of the Bhíls.

The Bhíls of the Vindya range have been described as a very hard-featured race. In this tract of the country many of the young men are particularly good-looking; and some of their women handsome, and remarkable for the elegance of their figures. They are said to be prolific, and very faithful to their husbands, whom they often accompany on their marauding excursions, and even to battle, carrying provisions and water, and sometimes themselves facing the enemy, and armed with slings, in the use of which many of them are very skilful. They cheerfully undergo great labour in these plundering expeditions; are generally, both men and women, very abstemious as regards food, though addicted to liquor; and have few wants which are not easily supplied by night attacks upon villages from any range of hills on which they may take up their position.

FIDELITY OF THE BHÍLS.

The fidelity of the Bhíls to their acknowledged chiefs is very remarkable. This feeling is quite independent of what we should consider the justice of their cause, the Bhíls, owing to their ignorance, being totally disqualified for the discussion or comprehension of such matters. The direction of their chief is all they look to; and so wonderful is the influence of the chief over this infatuated people, that in no situation, however desperate, can they be induced to betray him. If old and incapable of action they will convey him to places of safety. No hope of reward or fear of punishment affects them; and under the orders of their master they exult in the plunder of all those classes by whom they are considered and treated as the lowest of the human race.

During the period Capt. Black was employed in this quarter, though instant intelligence of all his movements was conveyed to the rebel Dowlut Singh, he was never himself able to obtain any information regarding the nature of the country, or the numbers, positions, and motions of the enemy. But on this subject I cannot do better than quote Capt. Black's own language, who, in reference to the proceedings in Kurruck and Chupan in 1827, remarks as follows:—

"Intelligence is not procurable for any sum of money; whilst not a single guard can quit this post without the strength and destination of it being instantly reported to the rebels, who remain concealed in the jungles or hills, ready to take advantage of the excellent information they receive. To counteract this, I frequently attempted to change the position of a guard during the night, but generally without success. In some instances my men refused to move till daylight; but whenever they did, the intelligence was instantly conveyed from hill to hill."

Capt. Tod, in illustration of the faith which may be placed in the pledged word of the Bhíls, relates as follows:—"Many year ago one of my parties was permitted to range through this [Aravulli] tract. In one of the passages of their lengthened valleys the lord of the mountain was dead; the men were all abroad; and his widow alone in the hut. [My servant] Madarri told his story, and claimed her surety and passport, which the Bhílni delivered from the quiver of her late lord; and his arrow, carried in his hand, was as well recognised as the cumbrous roll, with all its seals and appendages, of a traveller in Europe[1]."

---

[1] Tod, Vol. I., p. 11.

In some of the Bhíl districts, the arrows are used in lieu of drafts for money. The Selput Bhíl chief, on the occasion of a visit from some of the Native Government Agents, wishing to make them a present, regretted that a fire had destroyed all his cloth, &c., &c. "But, never mind," he said, "take this,"—drawing an arrow from his well-filled quiver,—"take this to any village of Kotah, and demand nine rupees." To another, he gave one on a second village to demand five rupees; which on being presented were honoured at sight; the Patels stating that they knew too well what would be the consequence should they refuse the arrows as drafts for money.

Owing to the impossibility of obtaining any authentic records regarding this strange race, the information which I have been able to collect from different sources is necessarily of a very cursory and superficial description; and the very defective communication which I now venture to make is not offered as one to be depended upon, but merely as a rough statement supposed to approach nearly to the truth; and which may, in some measure, serve as a guide, till a local investigation of the country, and a more thorough knowledge of the history, customs, and character of these tribes shall enable us to form a better judgment, and authorise my offering an opinion on this important subject with more confidence than I can presume to do with my present very limited experience.

Khairwarra,
20*th July,* 1841.

APPENDIX.

No. I.—Comprises copies of treaties with Grasya chiefs of Meywar made in the beginning of 1828, by mediation of Major Speirs. These are generally engagements to cease from disturbance and plunder, and from entertaining rebels; and to attend the government in its service when called upon; to hold themselves responsible for losses sustained by travellers and traders within their territories; and to collect their revenues according to a regulated system.

No. II.

Miscellaneous Remarks on the Character and Customs of the Bhíls; by Colonel Robertson, formerly Collector in Candeish.

The Bhíl banditti are a timid race; screening themselves in fastnesses, and only, like beasts of prey, venturing abroad under cover of the night, or in the absence of forces. The men as well as the women, are very hard-featured. The clothing of the men is often not more than the calls of decency require. They can live on the products of the wilds, for a considerable time; but generally they show every sign of being badly fed. This is not because they cannot find employment, for they can all cultivate if they choose, but because they are inveterately idle, and would rather eat half a meal of indifferent food, provided they are not obliged to work, than a good and substantial meal procurable by labour. In their plundering expeditions they often live in the fields, at their appointed stations, with their families; and all their stock and effects consist generally of not more than a wretched cow or buffalo, a few fowls, a small fishing-net, and now and then a sword or matchlock, with a bow and plentiful supply of arrows. They are very cruel and regardless of life; will, any day, become assassins for a trifling recompense, and are very revengeful; they themselves comparing their enmity to the bite of a snake. They are immoderately fond of liquor; and it is to the quantity expended that the marriage of a Bhíl owes all its *éclat.* Rather than be deprived of this luxury for any time, they will resort to every excess. They kill and eat the cow, and have little or no religion. They share equally in plunder, except when under an hereditary chief, whose share is then a chowth.

The term Tarvi, applied to the Mohammedan Bhíls, supposed to have been converted to that religion in the reign of Aurungzeb, Sir J. Malcolm erroneously supposed to be a title.

The Mohammedan Bhíls are cleaner in their persons than the Hindu Bhíls; have better features; and are more civilised, speaking Hindustani.

The Patels often encourage the Bhíls in plunder, in order to share in their spoils.

The different classes of Bhíls are the Turvo, Nahallo, Bhílalas, Kokanís, Dorepass, Munchas. The latter race are very superstitious, changing their place of residence at the slightest ill-omen, such as the death of a dog or a fowl. Their honesty is surprising: on quitting a temporary residence, if they have been unable to pay the government dues, they have been known to send the sum the next year.

The Bhíls are kind and affectionate fathers, and great faith may be attached to their word. Their simplicity is extraordinary; if any offender is seized, he not only confesses his fault, but any others he may have committed; and details his adventure with the most apparent *sang froid* and innocence, stating the names of his associates, be they friends or near relatives. The seizure of their women is one of the best means of bringing the husbands to terms.

There is little religion among them. They keep all feasts, Hindu and Mussulman, with equal zeal; and the most solemn form of oath is that of mixing salt, cowdung, and jowarree, and lifting up the mixture: this is called the meat gowree. If a Bhíl perjures himself on this oath he is deemed execrable, and abandoned by his caste.

No. III.—Consists of Extracts from Sir John Malcolm's Memoir on Central India, Vol. I., pp. 516, 517, 524, 526, 550, 576; Vol. II., pp. 155, 179, 450, 469.

No. IV.—Is a treaty between the East India Company and the Maharana Bheem Sing, of Oodeypore, concluded at Delhi on the 13th January, 1818, whereby the Maharana entrusted his dominion to the protection of the British Government. See Treaties, printed by Parliament, February, 1819, p. 38.

No. V.—Contains a statement of the dues levied by the Bhíl Pals between Oodeypore and Khairwarra, and a list of the Grasya Hill chiefs of Babul and Khairwarra.

ART. X.—*On the Hyssop of Scripture; by* J. Forbes Royle, M.D., F.R.S., L.S., *and* G.S., &c., *Professor of Materia Medica and Therapeutics, King's College, London.*

[*Read June* 15, 1844.]

When I lately had the honour of reading a paper before the Society, on the Mustard Tree of Scripture, I ventured to make some observations on what I considered to be the requisites for, and the best mode of pursuing, as well as upon what we should admit as proofs in, such enquiries. I proceed now to treat of another Biblical plant, which is not less interesting than the Mustard Tree to determine. This is the Hyssop, frequently mentioned in the Old, and twice independently in the New Testament, and which, if we are to judge by the numerous attempts which have been made to ascertain the particular plant that is meant, is not less difficult to determine, than any one of the several unascertained plants of the Bible.

That I may not seem to exaggerate what appeared to others the difficulties of ascertaining this plant, I will quote the commencement of the article on Hyssop of the learned and judicious Celsius: "De plantis plerisque in Hebræo Veteris Testamenti codice commemoratis, imprimisque de אזוב, recte pronuntiare, res est longe difficillima. Veritatem hic, si uspiam,

Scruposis sequimur vadis.
Fronte exile negotium,
Et dignum pueris putes.
Aggressis labor arduus,
Nec tractabile pondus est,

ut loqui amat Terentianus." It was not to Celsius alone that this appeared to be a difficulty; for he says farther on, "Aben Ezra, inter Ebræos commentatores facile princeps, suam ignorantiam, circa hanc stirpem, palam, et ingenue fatetur ad Exod. xii. 22;" and he thus translates the passage from the Hebrew of Aben Ezra: "*Quænam hæc sit plantarum, ignoro,*" "cætera, quanta est, Rabbinorum turba modo hanc, modo aliam conjectando, satis declarant, hujus plantæ notitiam sibi, Ebrææque genti periisse." Celsius Hierobotanicon, i. pp. 407 et 409.

Trusting that according to the acknowledged difficulties of the undertaking, so will be the indulgence accorded to any attempt to unravel its intricacies, I proceed, in the first instance, to adduce the passages in Scripture referring to Hyssop.

The first mention of Hyssop in the Old Testament, is immediately previous to the departure of the Israelites out of Egypt, and at the first institution of the Passover, when Moses called for all the elders of Israel and said unto them, (Exodus xii. 22,) "And ye shall take a bunch of *hyssop*, and dip it in the blood that is in the bason, and strike the lintel and the two side posts with the blood that is in the bason." From this passage it is evident that the plant must have been indigenous in Lower Egypt, and that it must have been sufficiently large and leafy, to be fit for sprinkling the door posts as directed. 2. The next notices of the hyssop are in Leviticus and in Numbers, which books having been written by Moses, indicate that the substances which he directs to be employed for sacrificial purposes, must have been procurable in the situations where the Israelites wandered, that is, in the countries between Lower Egypt and Palestine. Thus in the ceremony practised in declaring lepers to be clean, the priest is directed (Levit. xiv. 4) "to take for him that is to be cleansed, two birds alive and clean, and cedar wood, and scarlet, and *hyssop*." These are again all mentioned both in verse 6 and in verse 52. So in Numbers xix. 6, in the ceremony of burning the heifer and preparing the water of separation, the directions are: "And the priest shall take cedar wood, and *hyssop*, and scarlet, and cast it into the midst of the burning of the heifer;" and in verse 18, "That a clean person shall take *hyssop*, and dip it in the water, and sprinkle it upon the tent, and upon all the vessels, and upon the persons that were there," &c. Here we again see that the hyssop must have been large enough to be suitable for the purposes of sprinkling; that it must have been procurable on the outskirts of Palestine, probably in the plain of Moab. It is to this passage that the Apostle alludes in Hebrews ix. 19: "For when Moses had spoken every precept to all the people according to the law, he took the blood of calves, and of goats, with water and scarlet wool, and *hyssop*, and sprinkled both the book and all the people." In this passage we obtain no additional information, but as in the Septuagint the application of the Greek term *ὕσσωπος* as the equivalent of the Hebrew name *esof*. 3. The next passage where hyssop is mentioned in chronological order is in the beautiful psalm of David, where the royal penitent says (li. 2), "Wash me throughly from mine iniquity, and cleanse me from my sin;" and in verse 7, "Purge me with *hyssop*, and I shall be clean: wash me, and I shall be whiter than snow." This expression is considered by Bishop Horne (and also by others), in his Commentary on the Psalms, to refer to the rite described in the above passages, as the ceremony of sprinkling the unclean person with a bunch of "hyssop," dipped in the "water of separation."

But though the passage no doubt has a figurative signification, yet, with all due deference to such high authorities, the mode of expression is so direct, as to appear to me, as if the hyssop itself did possess, or was supposed to have some cleansing properties. If so, such might have led originally to its selection for the different ceremonies of purification, or such properties may have been ascribed to it in later ages, in consequence of its having been employed in such ceremonies. At all events, if the plant which we suppose to be the hyssop of Scripture can bear this signification, it will not be less appropriate. 4. The next notice of hyssop is in 1 Kings iv. 33, where in the account of the wisdom of Solomon it is said: "And he spake of trees, from the cedar tree that is in Lebanon even unto the hyssop that springeth out of the wall: he spake also of beasts, and of fowl, and of creeping things, and of fishes." In this passage we find that the plant which is alluded to by the name of *esob*, must also have grown upon a wall, though not necessarily to the exclusion of all other situations. Some commentators have inferred that the plant alluded to must have been one of the smallest, to contrast well with the cedar of Lebanon, and thus show the extent of the knowledge and wisdom of Solomon. But nothing of this kind appears in the text. The last passage which we have to adduce occurs in the New Testament, where in the crucifixion of our Saviour the Apostle John relates (xix. 29): "Now there was set a vessel full of vinegar: and they filled a sponge with vinegar and put it upon *hyssop*, and put it to his mouth." This passage has elicited the remarks of various critics, and inferences have been drawn respecting the nature of the plant, from the use to which it was applied. Others have observed, that the Evangelists Matthew and Mark, in relating the same circumstance, make no mention of the hyssop, but state that the sponge was put upon a *reed*, and given him to drink. The deductions which we may legitimately draw from the above passage are, that the hyssop was a plant of Judea, found indeed in the immediate neighbourhood of Jerusalem, and that it seems to have been used as a stick to which the sponge was fixed. If the plant which I suppose to be hyssop is calculated to answer this purpose, it will likewise answer for the elucidation of the parallel passages in the other Evangelists. Salmasius, as quoted by Celsius says: "Quodcunque feceris, et licet in omnia tete vertas, probabilem aliam verbis Evangelistæ explicationem adplicare non possis, præter eam, quæ *ὕσσωπον* pro calamo, vel virga hyssopi, cui alligata erat spongia Christo porrigenda, accipit. Ibi ὕσσωπον locum plane occupat καλάμου, cujus eandem ad rem usus apud alium Evangelistam."

Before proceeding to ascertain the particular plant which is alluded to, in the above passages, it is necessary to notice the name of hyssop in the Hebrew, as also those which were considered its synonymes in the several ancient versions of the Scriptures. For this information I am indebted chiefly to Celsius. The Hebrew name אֵזוב *esobh*, written also *esob* and *esof*, also by some *azub*, Celsius derives from a Hebrew root אזוב: "Nempe Arabum ازب idem est, quod Hebr. זוב fluere, quo nostrum אזוב referri solet; ut ab aspergendo nomen acceperit." The Greek he derives from the Hebrew name: "ab אזוב *esob* derivandum esse Græcorum ὕσσωπον, unde Latini *hyssopum* habent, nulla est ratio, cur dubitemus, nam equidem frustra sunt, qui אזוב Ebræorum, et ὕσσωπον Græcorum, re et nomine differre volunt, ac in nominibus illis non esse nisi fortuitam soni vicinitatem; unde concludunt, haud esse necessarium, ut, quæ planta Ebræis est אזוב, sit omnino statuenda ὕσσωπος Græcorum; ex qua hypothesi tot diversæ plantæ ab unica אזוב in versionibus interpretum propullularunt." In this derivation agree Salmasius de Homonymis Hyles Iatricæ, p. 19, and Bochart Geogr. Sacr. 494, "duumviros reipublicæ literariæ clarissimos:" and Celsius adds, "Neminem puto fore tam morosum, ut etymi hujus veritatem in dubium vocare sustineat." Notwithstanding which, I cannot help thinking with the authors above alluded to, that the similarity in the sound of the two names is accidental, and has distracted the attention from other plants, to one which does not answer to all that is required. But it is quite possible that the name hyssop may in later times have been applied to the same plant, which at a certain period was indicated by the term esob or esof. Celsius further states, from Ovidius Montalbanus in Horto Botanigraphico, pp. 47 et 48, "Hyssopus Salomonica, que erumpit e pariete, Hebraice *esof*, et Chaldaice *esofa*." Also that according to Maimonides, Saadias, Kimchius, and Bartenora, אזוב *esob* of the Hebrews, is *satur* صعتر of the Arabs. This is variously translated, *origanum*, *thymbra*, *satureia*, *serpyllum*, in different Lexicons; but *majorana*, *marum*, &c., "Talmudicis doctoribus," (Celsius, l. c. p. 409); while in the Persian version درمنه *diramne* is given as the synonym of esob, which is said by Castellus to refer to *Absinthium ponticum*. It is translated *muscus* in the Latin version of Junius Tremellius; in that of Piscator, *libanotis* v. *Ros marinus; Origanum* in dissertations of Anguillaria, &c. "His adde ὑσσὶν, et ὑσσωπὸν et οἴσυπον, quæ in Evangelista Johanne pro *hyssopo* legenda, superioris ævi Aristarchi censuerunt. Sed non raro *interpretum conjecturæ,* ut ait Cicero, *magis ingenia eorum, quam vim consensumque naturæ declarant.*" Celsius, l. c. p. 410.

The several plants which have been considered by different authors to be the Hyssop of Scripture, are enumerated by Celsius under eighteen different heads. These we shall group together according to their natural affinities.

1. Adiantum Capillus Veneris, or Maidenhair, a native of South Europe and of the East, is adduced as the hyssop of Solomon, by Lemnius, but he thinks that this is distinct from the hyssop of the other passages of Scripture: "Quoniam itaque exiguus est, atque e parietinis erumpit, hunc pro Hysopo designari arbitror." (Herb. Bibl. Expl. p. 68.)

2. Asplenium Ruta muraria, L., or Wall Rue, formerly called Salva Vitæ, or Salvia Vitæ, common in the fissures of rocks in Europe, is adduced by Deodatus in the notes to the Italian version. Both of these are of the class of Ferns.

3. Tremellius, adopting in some measure the opinion of Lemnius, yet translates *esob* by *muscus,* and considers Polytrichum commune, or common Hair Moss, found both in Asia and Europe, to be the plant.

4. Ovid. Montalbanus (in Horto Botanigraphico, pp. 47 et 48), conceives, in a passage quoted by Celsius, that *esob* is the small plant called *klosterhysops* in German, and which Celsius ascertained to be the Alsine pusilla, graminea, flore tetrapetalo, of Tournefort, Sagina procumbens, L., or Procumbent Pearlwort, a native of Europe in sterile and moist fields, of the natural family of Caryophylleæ.

Of the tribe of Compositæ, and genus Artemisia, two species have been thought to be hyssop. 5. Abreta or Abrotonum. "Joh. Mercerus, profundæ in Hebraicis doctrinæ vir, existimabat (*Abratham*) esse Græcorum, et Romanorum Abrotonum." This is the Artemisia abrotonum, L., or Southernwood, a native of the South of Europe and of Asia Minor, and which was, according to Celsius, thought to be the hyssop, by some of the Hebrew doctors. Casaubon remarks that it was probably this kind of hyssop which was given with the sponge and vinegar. "Idque eo consilio, ut potionem Domino pararent penitus amaram, penitus ingratam." 6. Artemisia Pontica (including probably also A. Judaica), a native of the South of Europe, Syria, and Central Asia, "unde semen contra vermes colligitur et ex Chorasan deportatur Halebum;" It. *Seme santo,* Lat. sementina, is adduced by Castellus as a translation of the *Diramne* which occurs in the Persian version, but which is usually translated Thymbra, *Satureia Thymbra.*

The majority of plants which have been adduced as the hyssop of Scripture belong to the natural family of Labiatæ, of which many species "are known for their uses in seasoning food, as thyme, sage, savory, marjoram, and mint, while others, as lavender and rosemary, are more celebrated for their uses as perfumes. Many of these having been described in the works of the ancients, have found their way into those of the Asiatics, where Lavandula stæchas may be found under the name *oostakhoodus;* rosemary under *ukleel ool-jibbul;* thyme as *hasha;* hyssop, *zoofae yabis*; basil, *rihan;* marjoram, *satur;* mint, *nana;* and sage under the names *salbiah* and *sefakus*, which last are evident corruptions of *salvia* and *elisphacos*." (Illustr. Himal. Bot. p. 302.)

The several plants of the family of Labiatæ which have been adduced by different authors, are as follow,—

7. Prosper Alpinus figures as Hyssopus Græcorum, a plant he describes as "plantam nobilissimam," having grown it from seeds obtained from Crete, and "Origano Oniti" (pot-marjoram) "adprime similem, esse legitimum hyssopum visum est."

8. Some of the Hebrews (v. Celsius) call a plant *esob javan*, which by the Arabs is called *istuchudus*, and of which the leaves resemble the plant called *zatar* (v. infra). The Arabic name is probably a corruption of Stæchas, which is Lavandula Stæchas, L.; a plant found in the Mediterranean region.

9. Rosmarinus officinalis, or common Rosemary, a native of the Mediterranean region, and which may perhaps be found in Palestine: "Quod in Galilea etiam frequens sit, auctoribus Radzivilio et P. Dappero." (Cels. l. c. p. 418.) Some of the older authors have selected this plant, because being a shrubby species, a stick might easily be obtained, to which the sponge dipped in vinegar could have been tied. It is suitable also for sprinkling.

10. Origanum Majorana, *Σάμψυχον* of the Greeks, and *schomschok* of the Talmud, was considered to be the hyssop by Pena and Lobel. (Stirp. Advers. p. 212.) It is doubtful whether this be not Origanum Onites. (Spr. ii. 507.)

11. Mentha, or a species of mint, is adduced in the Ethiopic version.

12. Mentha Pulegium, another species of the same genus, the γλήχων of the Greeks, and *foodnuj* of the Arabs, and *siah* of the Talmud.

13. Teucrium Polium, or Teucrium pseudohyssopum, *Schreb.* a native of the Mediterranean region, and found by Bové in the desert of Sinai, is brought forward by Columna, not only as the hyssop of the Greeks and Romans, "sed ipsius quoque Mosis et Salomonis veram et genuinam hyssopum."

14. Thymus serpyllum, or common Thyme, widely diffused in mountainous situations in Europe and Northern Asia; *hasha* of the Arabs, and קורניף Talmudicis. Cels. l. c. p. 423.

15. In the Arabic version of the Books of Moses, *esob* is translated by صعتر *satur* or *zatur* of the Arabs, *zitri* of Talmudical writers; the Arabic name is considered by them to be synonymous with *ορίγανος* of the Greeks, supposed to be Origanum heracleoticum, L., but several different species or varieties are included under the Arabic name *satur*, which it is needless here to inquire into, as they are all similar in nature and properties.

Some other names, as, 16. Hyssopus cochaliensis, and, 17. Marum album, Maruchivara Talmudicis, are adduced by Celsius, pp. 416 et 419, which I have not yet traced. Sibthorp (Fl. Græca, i. pp. 596, 597,) mentions that in Greece the name ὑσσώπος is applied both to Satureia græca and to S. juliana. He himself conjectures that Thymbra spicata may be the ὕσσωπον ὀρεινην of Dioscorides. Thymbra verticillata, L., was similarly adduced by Dalechamp.

The only plant which remains of those adduced by Celsius is, 18. the common or garden Hyssop, Hyssopus officinalis of botanists, which is supported by Celsius himself. It has had the greatest number of suffrages, apparently from the similarity of name. This may or may not be accidental. It is in the first place desirable to know, not only whether the *esob* of the Hebrews, the ὑσσώπος of the Greeks, and the *hyssopus* of the Romans, was the same plant, but also whether what we now call hyssop is the same plant as any one of these. Of this, I believe, with Sprengel, and others, there is no proof.

The account given of the hyssop by Dioscorides is so imperfect, that we have no points of comparison given in the article on this plant. But in describing οριγανον, (*Origanum heracleoticum*), the leaves are described as being similar to those of hyssop, but that its umbel is not rotate, as if he wished to indicate that such was the inflorescence of the hyssop. In the chapter on Chrysocoma it is said that it has a corymboid coma, like the hyssop. Nicander moreover has stated that the hyssop is like marjoram (σαμψύχον) and the Arab Isaac Ebn Amram compares zoofa (زوفا) with marjoram. Besides this, Dioscorides mentions that there are two kinds, one mountain, and the other garden hyssop, and that the best is produced in Cilicia; Pliny adds "in Pamphylium et Smyrneum." The Arab authors, Abu'l Fadli and Al-Olaji, as quoted by Celsius, also mention two kinds, the mountain and the garden. In the Talmud authors, that which is found in the desert is distinguished from the garden kind. Maimonides, as quoted by Celsius, says: "Hyssopi multæ sunt species, in legem autem hæc qua homines plerumque utuntur in cibum, quam nos melle condire solemus." That it was employed by the Greeks and Romans as a condiment is evident from its mention by Apicius; others describe it as bitter and fragrant; Dioscorides mentions only the diseases in which it is useful.

The modern hyssop (Hyssopus officinalis, L. Sp. 796) belongs to a genus of which itself is the only species. It is a perennial plant, usually very smooth; (but a variety is described by De Candolle, in the Flore Française, Suppl. 396, which he calls H. canescens, from its being covered with short rigid hairs.) The root throws up several leafy stems, which are woody at the base, diffuse and much branched. The branches are from one to two feet in length. The leaves are opposite, sessile, rather thick in texture, narrow, linear, lanceolate, in one variety elliptical; margins very entire, flat, or subrevolute; green on both sides; below, one-nerved; held up to the light and looked at with a magnifying glass, they seem to be obscurely dotted. The flowers, of a bluish or reddish colour, are arranged *along one side* of the stem in closely approximated whorls in a *terminal spike.* The floral leaves are similar to those of the stem, but smaller. Bracts lanceolate, linear, acute. The calyx is tubular, fifteen-nerved, with five equal teeth, with the throat naked. The corolla, of a reddish-purple colour, with its tube equalling the calyx, is bilabiate, with its upper lip erect, flat, and emarginate; the lower one spreading and trifid, middle lobe largest; stamens four, exserted, didynamous, diverging; the lower ones the longest; anthers two-celled; cells linear, divaricate; style nearly equally bifid at the apex; lobes subulate, with the stigmas at the apex. The four achenia (or seeds with their coverings) ovoid, three-cornered, compressed, and rather smooth.

The localities of the hyssop, as given by Mr. Bentham, the latest and most accurate author on the family (Labiatæ) to which it belongs, are as follow: "Hab. in Europa australiori et Asia media; in Hispania [*Pavon*], Gallia australi, Italia, Germania australi, rarior in Germania media [*Reichenbach*], in Belgio [*Dumortier*], in Rossia meridionali [*Prescott*], in Tauria et Caucaso in Jugo Altaico [*Bunge*]." M. Bové mentions a hyssopus within three leagues of Jerusalem, and the rosemary. I myself have obtained it, and the specimens have been examined by Mr. Bentham, from Kanum and the Ganthung Pass in Kunawur, a tract along the Sutledge on the northern face of the Himalayan Mountains, and which may be considered a part of Tibet.

The hyssop is remarkable for its fragrant and aromatic properties, hence its employment as a condiment and a sweet herb, and as a moderate excitant in medicine: to it, however, many other virtues were formerly ascribed.

Of all these plants, we need only say, as Celsius has already done respecting a plant which he thought to be less eligible than what is commonly known by the name of hyssop, "Nam postmodo, ubi de vera hyssopo aliqua dicenda erunt, Abrotonum cum reliquis, hyssopi umbris, uno falculæ ictu succidetur."

The plants adduced by the latest writers are, 1st, Phytolacca decandra, by Mr. Kitto in the Pictorial Bible in Exod. xii. 22. "The hyssop of the Sacred Scriptures has opened a wide field for conjecture, but in no instance has any plant been suggested, that at the same time had a sufficient length of stem to answer the purpose of a wand or pole, and such detergent or cleansing properties, as to render it a fit emblem for purification. Our wood-cut represents a shrub remarkable in both these respects, which is the *Phytolacca decandra*." Rosenmüller says, the Hebrew word esobh does not denote our hyssop, but an aromatic plant resembling it, the *wild marjoram*, which the Germans call *dosten* or *wohlgemuth*, the Arabs *zâter*, and the Greeks *origanon*.

Dr. Robinson, in the ascent of Jebel Musa by himself and Mr. Smith, says: "In all this part of the mountains were great quantities of the fragrant plant *ja'deh*, which the monks call hyssop," (Bibl. Res. i. p. 157); and on the ascent of St. Catherine, "The ja'deh or hyssop was here in great plenty; and especially the fragrant *za'ter*, a species of thyme, (Thymus serpyllum of Forskal,)" p. 162. Lady Calcott suggests that the hyssop of aspersion was hyssop tied to a stick of cedar. Winer, (Biblisches Real Wörterbuch, ii. p. 820,) admits the same plant as Rosenmüller, but considers that several plants were included under the name esobh; and concludes his observations on Ysop by saying: "We must, however, wait for more accurate observations upon the species of hyssop and origanum indigenous in Western Asia, before the meaning of the Hebrew *esobh* can be finally settled."

My attention was first directed to the subject when lately collating the list of drugs in the Latin edition of Rhases, with those in my own MS. Catalogue before alluded to. It is stated in that work, as indeed in that of Dioscorides, c., that there are two kinds of hyssop, the one a garden, the other a mountain plant; but Rhases further adds, that the latter is found on the mountain of the Temple, that is, of Jerusalem: "est herba quæ oritur in montibus Templi, folia u majorana. Sylvestri montanus fortior, et dicitur 'ysopus altaris.'" These two kinds are also noted by Celsius as "Hyssopus in montibus Hierosolymorum, زوفا بجبال القدس zoofa bu jibal al kuds," and "Hyssopus sicca, زوفا يابس zoofa yabis." Jerusalem is now called by the Arabs *El-kuds*, "the Holy," and also by Arabian writers *Beit-el-*

Mukdis, or *Beit-el-Mukuddus*, the Sanctuary, &c. (Robinson's Biblica Researches, i. p. 380.) Rhases again, in the article Epithymum (*Cuscuta* or Dodder), says of it: "Caret radice sed suspendit supra arborem yssopi magni et folia ysopi colligitur cum eo; et fit in montibus Templi." So Serapion, quoting Aben Mesuai, says of it: "Ex Creta ac domo sancta, allatum;" and of the hyssop, he quotes Isaac Eben Amram as saying, "Laudatissima, ex domus sanctæ montibus." Whether these expressions refer to the common hyssop, or to that which we conceive to be the true plant, it is not easy to determine, as the accounts are confused. But the large size of one kind indicates that it must have been a very different plant from the common hyssop. One troublesome circumstance is, that the translators of these Arabic works do not always adhere to the arrangement of their authors, as they sometimes convert the arrangement according to the Arabic alphabet, into one according to the Latin names and the Roman alphabet. Thus in the great work of Rhases, called Hawi, or "Continens," hyssop is described under the letter *ain*, and the name in the Latin translation is written *ysopus*; but in his work Ad Mansor, we have hyssop under the letter "Ze id est, Z," and two kinds mentioned, one called "Cyfe, id est, hyssopus quæ vegetatur," and the other written "Œsypus autem humida, quæ et cerotes dicitur, quæ ex lanæ sordibus fit." These two varieties refer to the زوفا يابس *zoofa yabis*, or *khooshk*, that is, dry hyssop, and the other to زوفا رطب *zoofa rutub*, Lana succida, οἴσυπος of Diosc. 2. c. 84. (N. 98. 2. Av. c. 364.) Here we have very clear evidence, that two very different things have been treated of under one name, apparently only because the Greek names are a little similar. Hence it is not impossible but that similar confusion may have taken place with the Greek ὕσσωπος, hyssopus, and an oriental name like the Hebrew *esob* or *esof*.

Having suspected the existence of a plant distinct from the hyssop, I was led to what appears to me its discovery, by a passage from Burckhardt's Travels in Syria, quoted by Mr. Kitto in his work entitled The Physical Geography and Natural History of the Holy Land, p. cclii.: "Among trees and shrubs known only by native names and imperfect descriptions: The aszef is spoken of this month by Burckhardt, while travelling in the Sinai Peninsula. On noticing its presence in Wady Kheysey, he describes it as a tree which he had already seen in several other wadys. It springs from the fissures in the rocks, and its crooked stem creeps up the mountain side like a parasitical plant. According to the Arabs it produces a fruit of the size of the walnut, of a blackish colour, and very sweet to the taste.

The bark of the tree is white, and the branches are thickly covered with small thorns; the leaves are heart-shaped, and of the same shade of green, as those of the oak. (Syria, 536, 537.)"

The above description, though apparently incorrect in the application of some terms, as that of *tree*, to a plant creeping like a parasitical plant, yet will strike most botanists, as a characteristic description of the Common Caper Bush, which is indigenous in these regions, and which I was aware had an Arabic name, in sound something like the *aszef* of Burckhardt. The caper plant is one of those which in the copious language of the Arabs has more than one name. It is well known that its most common name is كبر *kibbur* or *kubar*. From this the Greek κάππαρις, and the Latin *capparis*, appear to have been derived. In referring to one of the Persian works on Materia Medica, which has been published with an English translation by Mr. Gladwin, that is, the Ulfaz Udwiyeh, we are referred from capers in the Index to Nos. 1271. 175 and 184. The first of these is كبر or capers, the second is اصل الكبر *ussul ul kubir*, root of the caper bush. No. 184 is another name for the same thing, اصل الاصف *usul al ásuf*, as it is translated, root of the caper bush. We may learn also from other sources, that *asuf* is one of the names of the caper bush. Thus in the Kamus, or Great Arabic Dictionary, *asuf* is *al kubber*. So also in Freytag's Lexicon Arabico-Latinum, *asuf* is translated *capparis*; likewise in Richardson's Persian, Arabic, and English Dictionary, London, 1829, and in Shakespear's Hindustani Dictionary, we have اصف *asuf*, "the caper tree or root." That this has long been known to be one of the names of the caper plant is evident from Mentzel's Index Nominum Plantarum Multilinguis; where we have *alasif* given as an Arabic name of *capparis*, taken from the Index of Avicenua, editio Veneta, 1564. fol. I quote this, as I am unable to find the word in my own copy of Avicenna, Venice, 1555. It appears to be a corruption of *alasif* that Forskal heard applied to the caper plant which he found at Taas near Mocha, as a shrub growing out of a wall (Flora *Ægyptiaco*-Arabica), and of which he says, "Si hæc vera est Capparis spinosa, competit illi nomen Arab. Lasaf, لصف." This may be a corruption of الاصف, or Forskal may have written it simply اصف *asuf*, and the mere junction of the letters would convert it into لصف *lasuf*, a mistake which might easily be made even by the celebrated Niebuhr, as he published the work from Forskal's notes after his death. In my own MS. Materia Medica, *asuf* is given as a synonym of *kibbur*, with *kifarus*, as the Yoonanee or Greek name, which is evidently intended for *κάππαρις*, as the letter *p* is wanting in the Arabic alphabet.

The similarity in sound between the *asuf* of the Arabs and the *esof* of the Hebrews, cannot fail to strike every one, and this similarity would extend equally to the writing of the two names in the language of the other. A less degree of similarity has in other cases of Hebrew and Arabic names, been considered to indicate identity of origin in words in these two languages. This similarity might certainly be accidental, but it cannot be accidental that the plant called *asuf* by the Arabs, answers to every particular which is required for the due elucidation, not of one, but of every passage of the Bible in which *esof* is mentioned. This we shall proceed, we hope satisfactorily, to prove.

First with respect to its geographical distribution, the *asuf* like the *esof* ought to be found in Lower Egypt, in the Desert or country between the Red Sea and Palestine, and also in Palestine itself.

The Caper plant, *Capparis spinosa* of Linnæus and of all modern botanists, is well known to be abundant in the south of Europe, where it appears to be indigenous. It is found also in the islands of the Mediterranean and generally on the coasts of that sea, the Mediterranean region, of botanists. It is specifically mentioned as found in Lower Egypt, by Forskal in his Flora Ægypt.-Arab. as *Capparis spinosa*, called *kabbar* by the Arabs, growing wild in the neighbourhood of Alexandria. The same facts are stated by De Lile, in his Illustratio Fl. Ægypt. pp. 8 and 16, forming the botanical portion of the great French work on Egypt. Previous to these authorities, Prosper Alpinus had stated that the capers of Alexandria were larger than those of other places: "Capparis Alexandriæ majores quam alibi inveniantur proveniunt, quos *cappar* quoque appellant." (De Pl. Ægypti, p. 60.) So Pliny, "Likewise in Ægypt groweth capparis, a shrub of a harder and more woody substance: well known for the seed and fruit that it carrieth, commonly eaten with meats, and for the most part the capres and the stalke are plucked and gathered together. The outlandish capres (not growing in Ægypt) we must take good heed of and beware: for those of Arabia be pestilentiall and venomous: they of Africke be hurtful to the gumbs, and principally the Marmarike are enemies to the matrice, and breed ventosities. The Apulian capres cause vomit, and make lubricite both of stomack and bellie. Some call the shrub cynosbatos: others ophiostphayla." (Holland's Translation, lib. xiii. c. xxiii.) So in Av. c. 141, capparis is called *kabar* in the margin, with a reference to Diosc. 2. c. 166, "quædam est species, quæ e Rubro Mari defertur."

In Lower Egypt is also found another species, first discovered by Lippi, the *Capparis Ægyptia* of Lamarck. It is figured by De Lile, Fl. Æg. p. 93. t. 31. f. 3, and described by him as a spreading shrub, of which the branches are slender but firm; it grows in the mountains of the desert opposite Minyeh. This species was also found by M. Bové, and by Aucher-Eloy, in the desert in the neighbourhood of Suez.

In the deserts and tract of country in which the Israelites wandered, the caper plant, or some of the species of capparis resembling it in general appearance, are no doubt found in many places. The notices of it, however, are few, but the localities are so widely separated that we are warranted in considering that it might be found in many intermediate situations; and it would be so by competent travellers, that is, by those having some knowledge of Natural History.

From the description of Burckhardt already quoted, in which he saw the *aszef* in the Sinai Peninsula, springing from the fissures of rocks, with its crooked stem creeping up the mountain side like a parasitical plant, with a white bark and the branches thickly covered with small thorns, and heart-shaped leaves,—there can be little doubt of this being a species of capparis, and probably the caper plant. It is interesting to observe that he mentions it as a plant which he had already seen in several other wadys. We have however very definite information respecting the caper plant in this situation, as M. Bové, in his "Relation d'un Voyage Botanique en Egypte, dans les trois Arabies, en Palestine et en Syrie," (Ann. des Sc. Nat. i. p. 72,) says: "Le mont Sainte Catherine est au sud-sud-ouest du mont Sinaï. Dans les déserts qui environnent ces montagnes j'ai trouvé *Capparis spinosa*, &c." Belon (Obs. ii. c. xxi.) mentions "Capparis non spinosa—minores enim in Capparum stirpibus spinosis nascuntur . . . ," and at c. LX. "Per istos colles oberrantes, cappares invenimus, pumilarum ficuum altitudinem æquantes,—semina instar piperis calida." So Dr. Shaw, "Capparis Arabica, fructu ovi magnitudine, semine piperis instar acri." Belon. Obs. l. ii. c. 60. "Nostra tricubitalis est. Folia habet glauca, crassa, succulenta, rotunda, uncialia, Fructus, quem vidi, pollicis fuit magnitudine, oblongus cucumeris forma, quem Arabes appellant Filfal jibbel, *i. e.* Piper montanum. Copiose crescit in via ad montem Sinai." (Travels, vol. ii. p. 355.) More to the eastward we have no distinct notices of the true caper plant, but other species are found, as C. heteracantha and C. leucophylla, between Aleppo and Bagdad by Olivier. (D.C. Sp. 12 et 13.) So Aucher-Eloy mentions the banks of the Tigris as covered with "la plus vigoureuse végétation;" that is, with Tamarix, Salix, Capparis leucophylla. If we trace it to the southward, we have already mentioned, that Forskal found it as a small shrub growing out of a wall near Taas in the neighbourhood of Mocha. Dr. Falconer, late Superintendent of the East India Company's Botanical Garden at Saharunpore, has informed me that when at Aden on his way home, he saw the rocks there covered with a species of capparis, which appeared very like the common caper. A species very similar to it is also among the plants collected by Lieutenant Wellsted in the island of Socotra.

We have, thirdly, to find the caper indigenous in Palestine and Syria. This there would be no difficulty in doing, if travellers took the trouble of noting the vegetation of a country, as one of the features which distinguish its physical geography. Some omit all notice of common plants. Others notice a plant only when first met with. Mr. Kitto, who has made an abstract of nearly all the natural history information of most of the travellers in the Holy Land, mentions the caper, only in the fields near Aleppo, as observed by Dr. Russel. M. Aucher-Eloy mentions a species of capparis (C. effusa) in the neighbourhood of Mount Tabor. Dr. Clarke found "Capparis spinosa, common caper tree, at Cyprus, and in the Holy Land (Jaffa)." M. Bové, entering Palestine from Egypt, mentions on his arrival at Gaza, "Au nombre des plantes spontanées, je citerai les suivantes: *Capparis spinosa.*" Again, on his arrival at Jerusalem, he says, (l. c. p. 173,) "Dans les ruines croissent les Rhus coriaria, l'Hyoscyamus coriaria, le Momordica Elaterium, et le *Capparis spinosa.*" Belon had previously mentioned finding the caper plant in the vicinity of Jerusalem. (*v.* Rauwolf, p. 269.)

In the above references we have ample proofs of the caper plant, or *asuf,* being found in all the situations where the *esof* is mentioned in the Bible. That it grows out of the fissures of rocks, and the ruins of buildings is evident from some of the above extracts. Thus De Candolle gives as its habitat, "In muris et rupestribus Europæ australis et orientis." When at Aleppo, Rauwolf says (Travels, p. 49), "There grew also in the road and on old walls such plenty of capers, that they are not at all esteemed; they take these flowers before they open, and pickle them, and eat them for sauce with their meat;" and again, at p. 75, "and near it in old decayed brick-walls and stony places." So Ray, (Hist. Plant. p. 1629,) "Locis arenosis et ruderatis gaudet. Nos in muris et ruderibus Romæ, Senarum, Florentiæ et alibi in Italia observavimus spontaneam; cultam circa Tolonam in Gallo-provincia, ad muros et macerias."

We proceed now to show that capers were supposed to be possessed from the more ancient, we find it noticed, even in a botanical work, that "Les capriers excitent l'appétit, et sont regardés comme apéritives, antiscorbutiques, et propre pour tuer les vers. L'écorce de la racine est apéritive, diurétique et emmenagogue." Lamarck. Encycl. Botanique, art. *Caprier*.

So capers formed one of the "Quinque radices aperientes minores," or the five lesser aperient roots, as Caper, Dandelion, Eryngo, Madder, and Restharrow. It still holds a place in some of the German Pharmacopœias as well as in the Spanish, and continues to be employed throughout Eastern countries, where old remedies still enjoy their pristine repute. In Europe, it is now almost universally known as a condiment, its unexpanded flower-buds being preserved in vinegar.

It remains only to consider whether the caper plant is suitable to the passage of the New Testament in which the hyssop is mentioned, and it appears to me, that it is as well so, as any other that has been proposed.

The passage in which hyssop is mentioned has been much commented on, in consequence of the difficulty which commentators have experienced in finding a plant which should answer in all points to what is required. Thus it is said, John xix. 29, *Σκεῦος οὖν εκειτο οξους μεστον· Οἱ δε πλησαντες σπογγον οξους, και ὑσσωπῳ περιθεντες, προσηνεγκαν αυτοῦ τῷ στοματι*, or as translated in the authorized version. "Now there was set a vessel full of vinegar, and they filled a sponge with vinegar, and put it upon hyssop (*fixing it on a hyssop stalk* of some) and put it to his mouth." One difficulty has arisen from the evangelists Matthew and Mark, in describing the same occurrence, making no mention of the hyssop. Thus Matthew (xxvii. 48,) describes one, as bringing a sponge, *πλησας τε οξους, και περεθεις καλαμῳ*, and they "filled it with vinegar and put it on a reed, and gave him to drink." Mark (xv. 36,) in like manner writes, *και γεμισας σπογγον οξους, περεθεις τε καλαμῳ* "and one filling a sponge with vinegar, and placing it about a reed, gave him to drink."

In all the three accounts we have the sponge filled with vinegar, and given to our Saviour to drink; Matthew and Mark stating it, as being raised on a reed, while John omits all mention of the reed, but describes the sponge as being put on or about hyssop. By some commentators it has been supposed that the sponge and hyssop were fixed to a reed or stick, and that one evangelist has omitted all notice of the latter, and the two other evangelists of the hyssop. Other commentators argue, that in the relation of the same circumstances by these witnesses, it is evident that the reed or stick must be the same as a stick of hyssop. As John is the more particular in his description and usually supplies what has been omitted in the other accounts of our Saviour, and as he expressly states, xix. 35, "And he that saw it bare record, and his record is true," so are we bound to make our explanation suit his description.

The difficulty has been to find a plant fitted for the purpose and to which the name hyssop was applied; for it is acknowledged on all hands that the common hyssop is too short and too slender to be used as a stick. Some commentators therefore have proceeded so far as to suggest alterations in the text. Thus Camerarius for ὑσσώπῳ proposes ὑσσῷ, *pilo vel veruto,* "javelin or dart." Heinsius suggests ὑσσωτῷ, *asta,* "a spear or pike," and also οἴσυπος, *lana succida, vel sordida;* as the words ὕσσωπον and οἴσυπον are often confounded by others as well as by Arab authors, "multis locis apud auctores tam Græcos, quam Latinos, errore scribarum esse permutatas." (Celsius. l. c. p. 444.) Bochart again, retaining the name, has proposed changing the case of hyssop, "et pro ὑσσώπῳ legendum censuit ὕσσωπον. Quasi vellet Johannes: περιθεντες ὕσσωπον σπόγγῳ, posuerunt hyssopum circa spongiam: quæ explicatio est violenta; contraria vero maxime naturalis, cum sponte se offerat accusativus σπόγγον ex ingenio linguæ, et phraseos, hic subintelligendus, et repetendus, ut sit: περιθέντες (σπόγγον) ὑσσώπῳ, *i. e.* περὶ ὕσσωπον, quomodo Græci nonnunquam loquuntur." Celsius. l. c. p. 445.

Instead of supposing as in the above instance, that the hyssop was placed round the sponge, Celsius himself is of opinion that the sponge was filled with vinegar, and that to it was tied a bundle of hyssop, which might thus be contained in its middle when it was reached up to our Saviour. He further adduces Casaubon and others as agreeing with this explanation, as well as with the Ethiopic version, where we read, "Et erat ibi vas aceto plenum, et impleverunt spongiam aceto, ac foliis hyssopi, et ligarunt super arundinem."

But all these explanations and interpretations are variations from the plain and obvious meaning of the passage of St. John in which the sponge filled with vinegar is described as being put upon hyssop, that is, a stick of hyssop, and raised to our Saviour on the Cross. The difficulties experienced have arisen from the common hyssop, which is generally supposed to be the plant alluded to, not being suited for the purpose. But we have already seen that the common hyssop does not answer in any respect to what is required. The caper plant, which we have seen exactly appropriate to so many of the passages, seems also well suited to the present, as it will yield a stick large enough for the purpose. And this is required by some of the versions, as the old Italian, *un basto e d'hissopo:* likewise in the Spanish, and in the

French edition of Montensi, *au bout d'un baton d'hyssope.* So also in that of many celebrated men.

Some also of the ancient statements refer evidently to a larger plant than the common hyssop. Thus Josephus, (Antiq. lib. viii. cap. 2,) ranks it with trees. By the Rabbins it was included among woods, "hyssopum inter ligna censeri apud Rabbinos." Tract Shebiit, c. viii. § 1. Parah, c. xi. § 8. So in Tract. Succah, fol. xiii. 1, "inter mentionem cannarum, et surculorum, quibus obtexerunt Judæi tentoria in festo tabernaculorum memorari etiam hyssopum." (Celsius. Hierobot. 439—442.) It is more than probable that the *asuf*, or caper plant, is the *esob* or *esof* referred to in these passages, and Winer says, "Truly it cannot be concealed, that the Talmudists distinguish the hyssop of the Greeks and Romans from the *esobh* of the Law." Biblisches Real Wörterbuch. ii. p. 820.

The height of a shrub which would be fitted for such a purpose may be judged of, by what must have been the fact, that the Cross of our Saviour could not have been higher than what any man of moderate stature might, with an ordinary stick and his arm stretched out, easily reach the mouth of our Saviour. For it is evident that the cross to be of sufficient strength and yet carried by a man, could not also be very lofty.

For such a purpose it is evident that no large tree is required, because a shrub of moderate dimensions would easily yield a stick of three or four feet in length; and such any of the old caper bushes or trees, as they are sometimes called, growing in the congenial climate of Palestine, would be able to supply. "Ibi, [that is, in Egypt] et capparis firmioris ligni frutex." Plin. xiii. c. 23. The prickly nature of the stem, moreover, would better fit it for the purpose of having the sponge affixed to it. The caper plant was not only a plant growing wild on the rocks and walls of Jerusalem, no doubt, in ancient times as at the present time, but one which seems from the earliest times to have been valued as a medicine, and its flower-buds employed as an article of diet, or rather as a condiment. If it was allowed to hazard a conjecture, we might say that a notched stick, or a cleft reed, might have been employed in gathering the caper buds from off the extremities of the branches, and to this, the name of hyssop stick might correctly be applied. This employment of capers is further interesting as explaining in some measure the presence of the vessel full of vinegar (*οξους μεστον*). The word *οξος*, which is translated "vinegar" in the English version, and *acetum* in the Latin, is sometimes translated "sour wine," and is supposed to have been there for the refreshment of soldiers. It may have been so; but it is curious that vinegar, (which was also called *οξος* by the Greeks, as we may see in a nearly contemporary author, that is, Dioscorĭdes, lib. v. c. xxii, *περι οξους*,) should have been required for preserving different parts of the caper plant in those days as at the present time. For we learn from Pliny, who says of fruits eaten, "In fruticoso genere, cum caule capparis," lib. xv. c. 28. Again, xiii. c. 28. "Ibi et capparis, firmioris ligni frutex, seminisque et cibi vulgati caule quoque una plerumque decerpto." "Likewise in Egypt groweth capparis, a shrub of a harder and more woodie substance: well knowne for the seed and fruit that it carrieth, commonly eaten with meats, and for the most part the capers and the stalke are plucked and gathered together." (Holland's Pliny, xiii. c. 23, and in other places.) "Tritum ex aceto semen decoctiam," &c. "The seed of capres sodden in vinegre, bruised and applied to the teeth, &c. It cureth also the infirmities of the liver. The manner is to give the same in vinegre and honey. Boiled in vinegre, it is singular for the cankers or exulcerations within the mouth." (Lib. xx. c. 15.) The caper plant, though wild in so many parts of the Roman Empire, was yet cultivated even in that age. "Quippe cum capparis quoque seratur, siccis maxime, area in defossu cavata, ripisque undique circumstructis lapide: alias evagatur per agros et cogit solum sterilescere. Floret æstate, viret usque ad Vergiliarum occasum, sabulosis familiarissimum." (xix. c. 8.) Ray describes the process: "Gemmas florumadultas—colligunt,—Tum vasi immittunt, et acetum super affundunt." Hist. Plant. 1629.

The caper plant is however supposed by many to be mentioned in Scripture by the name *abiyonah*, in Eccles. chap. xii. v. 5, which in the Septuagint and Vulgate has been translated *capparis*. This is not admitted by others, as in the authorized English version, where *abiyonah* is translated "desire" "When the almond tree shall flourish, and the grasshopper shall be a burden, and *desire* (abiyonah) shall fail." As the name *abionoth* was applied to the small fruits of trees and to berries, so it has been thought to be the same word as *abiyonah*, and to indicate the caper bush. This plant may have had two names in the Hebrew language, as indeed it has in the Arabic, and we may suppose it to be particularly adduced as growing especially on old walls and tombs. Further, if we suppose, as is natural, that the figurative language employed by Solomon is carried on throughout the sentence, it appears to me appropriate. For the caper plant, like most of its tribe, is conspicuous for its long flower-stalks, which are erect when the plant is in flower and the fruit young, but which bend and hang down as the fruit ripens. "As the flowering of the almond tree has been supposed to refer to the whitening of the hair, so the drooping of the ripe fruit of a plant which is conspicuous on the walls of buildings and on tombs, may be supposed to typify the hanging down the head before 'man goeth to his long home.'" Cycl. of Biblical Lit. art. *Abiyonah*.

The caper plant is too well known to require a description, especially as so many details have already been given respecting its habit. We have seen in the first place, that it has a name, *asuf*, in Arabic, sufficiently similar to the Hebrew *esof* or *esobh*. It is found in Lower Egypt, in the deserts of Sinai, and in Palestine. Thus it is found in all the places where the *esobh* must have been indigenous, for the Israelites to have been able to obtain it for their religious ceremonies. Its habit is to grow upon the most barren soil, or rocky precipice, or the side of a wall, and this is also essential; for it is said, that Solomon knew all plants, from the cedar of Lebanon to the hyssop that groweth on the wall. It has moreover always been supposed to be possessed of cleansing properties; hence, probably, its selection in the ceremonies of purification, or its employment in these may have led to the supposition of its possessing the power of curing diseases like leprosy. Finally, the caper plant is capable of yielding a stick to which the sponge might have been affixed, as we learn from St. John was done with the hyssop, when the sponge dipped in vinegar was raised to the lips of our Saviour. A combination of circumstances and some of them apparently too improbable to be united in one plant, I cannot believe to be accidental, and have therefore considered myself entitled to infer, what I hope I have now succeeded in proving to the satisfaction of others, that the Caper Plant is the Hyssop of Scripture.

Vol VII p 110

ART. XI.—*Summary of the Geology of Southern India. By* CAPTAIN NEWBOLD, F.R.S., &c., *Assistant Commissioner for Kurnool.*

[*Continued from p.* 171.]

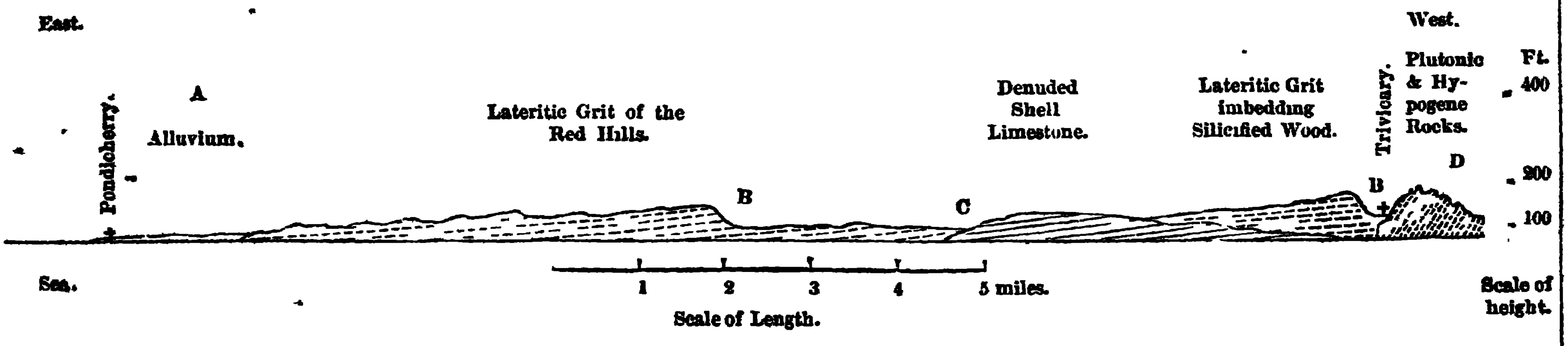
PART IV.

FOSSILIFEROUS LIMESTONE OF PONDICHERRY.

Geographical Position.—About nine miles inland of Pondicherry on the Coromandel coast, Lat. 11° 56′ N., are beds of limestone rising in gentle undulations, and running in a S E by E. direction, almost parallel with the coast, for a distance, as far as I was able to trace, of about four or five miles. Of these strata no detailed account had been published up to the date of my visit in March, 1840. They are seen to crop out near the villages of Sydapett, Carassoo, Coolypett, and Vurdavoor, from a superincumbent tertiary lateritic grit imbedding large quantities of silicified wood, and of which a description has been given by Lieutenant Warren: who has, however, overlooked the fossil limestone. The beds of the latter dip very slightly easterly. The greater part of the surface of the limestone is concealed by the soil and vegetation. A short distance further towards the west it is again covered by beds of the silicified wood deposit, and both are underlaid by plutonic and hypogene rocks, which crop out near the village of Trivicary, and form the western boundary of the fossiliferous beds. Rolled and angular fragments of the hypogene rocks are scattered here and there over the limestone, as well as fragments from the silicified wood beds, and from the limestone itself, the surface of the latter has evidently been exposed by the denudation of the superincumbent beds. It appears in surface-worn tables traversed by innumerable fissures.

Lithologic character.—It is usually of light brownish or grey colour; texture subcrystalline, graduating into earthy; tough under the hammer, and interstratified with argillaceous and ferruginous beds of a looser structure, which often abound with fossil shells. Some parts of the rock are so speckled with a dark-coloured sand as to resemble a *peperino,* though the nature of the sand, whether volcanic or not, cannot be safely pronounced upon. Other varieties are hard and compact enough to bear as fine a polish as many of our mountain limestones. It has been long used for the steps of doors, and in some of the pavements and old fortifications at Pondicherry; the remains of the old quarries are still to be traced though choked up by rubbish.

Section, nearly East and West, of the Fossiliferous Beds of Pondicherry, from the Sea to the Hypogene and Plutonic Rocks near Trivicary.



It will be observed in this section that, though the limestone has not been observed in contact with the hypogene and plutonic rocks, yet it is evident that it is of more recent origin, by the unconformability of the stratification.

The shells are, with few exceptions, pelagic: they occur distributed confusedly in the rock: the bivalves often vertical, and sometimes with their hinges uppermost. The valves of some are half opened: in others closed. Some have been deprived of one of their valves. Many have been compressed and flattened; and the exterior of a few exhibit distinct and beautiful impressions of smaller shells. The cavities of others again are filled with crystallized carbonate of lime; which may be received as an indication of the shell's being tenanted at the time of its entombment.

Since the period of my visit a large collection has been made of these fossils by Messrs. Cunliffe and Kaye, of the Madras Civil Service, most of which have been named as follows by Dr. McLelland; whose list, as it comprises all the fossils discovered by myself, and many other species besides, will be adhered to, (merely arranging them after Lamarck,) until a more minute examination is made of them in Europe, whither a collection has been already transmitted for the purpose of a careful comparative scrutiny and classification. This they well merit, considering these beds and those of Trichinopoly are almost the only marine deposits that occur over the great extent of Southern India.

Class ANNELIDES,—Fam. *Serpulacea.*

Serpula recta.

Class CONCHIFERA,—Fam. *Arcacea.*

Cuculla crassatina (?) Desh.
Arca Cunliffei.
—— crassatina.
Nucula pectinata.

Fam. *Malleacea.*

Inoceramus.

Fam. *Ostracea.*

Ostrea trabeculata.
Gryphæa.

Class MOLLUSCA,—Fam. *Calyptrace.*

Piliopsis plana. Same, or allied to a shell in the coal formation at Cherra.
—— rotunda.

Fam. *Colimacea.*

Bulimus Indicus.
—— Pondicerianus.

Fam. *Melaniana.*

Melania (?) imperfect.

Fam. *Peristomata.*

Paludina[1], allied to Paludina semicarinata, Brand. Desh. Coq. Fos. Pl. xv. Species of this genus existing in India and elsewhere.

Fam. *Neritacea.*

Nerita transversaria. Single specimen, imperfect.
Natica sulculosa.
Nerita speciosa (?)

Fam. *Scalariana.*

Scalaria annulata.
——— zonata.
——— tricostata.
——— bicostata.
——— Kayeii.

Fam. *Turbinacea.*

Trochus linearis.

Fam. *Canalifera.*

Murex levis.

Fam. *Orthocerita.*

Baculites, compressed, tapering, and consisting of short joints. Margins unequal, both somewhat flattened.

Fam. *Nautilacea.*

Nautilus, three distinct species.

Fam. *Ammonacea.*

Ammonites.

Echini, fishes' teeth, and Hamites, corallines of the Turbinalia species, and others of a pyriform shape. There are also shells of the families Myaria, Nymphacea (Astarte), Cardiacea, Mytilacea, Pectinides, Ostracea (resembling Exogyra), Turbinacea (Turritella ?), Canalifera (Pyrula ?) Alatæ (Rostellaria?) Purpurifera (Buccinum ?) Convolutæ (Voluta), Ammonacea (Orbulites and Crioceratites). A number of sulcated cylindrical bodies, not exceeding the thickness of a quill, of different lengths, but generally from two to three inches long, and in all cases broken off, are scattered in the substance of the rock. They resemble somewhat the spines of echinides. There was also found the vertebra of a fossil which Professor Owen pronounces to resemble that of Mososaurus.

Mr. Murchison states in his Anniversary Discourse, p. 136, there can be no doubt that these fossils belong to the Cretaceous system.

---

[1] It is much to be regretted that the only specimen in the collection is not sufficiently perfect to allow of the species to which it belongs being accurately determined; but the presence of a freshwater shell is important, as tending to show the deposit to have taken place near the mouth of a river, or in a basin alternately subject to salt and fresh-water.

Since then they have been ascertained by Professor Forbes to belong to the Lower Greensand, and Neocomian beds.

In a Paper by Mr. Kaye, in the Madras Journal of Literature and Science, for June, 1844, p. 151, that gentleman says, "In a former number of this Journal Lieutenant Newbold suggested that the fossiliferous beds of Pondicherry probably extended into the Verdachellum talook of South Arcot[1]. It was long before I was enabled to obtain any positive evidence of this fact; and it proves how little dependence can be placed on native evidence, that all inquiry among those who ought to have been best acquainted with local circumstances failed to elicit the required information. Accident, however, subsequently established the correctness of Lieutenant Newbold's views. * * * Mr. Murray, the Sub-Collector of South Arcot, in the course of a ride, about six or seven miles from Verdachellum, observed that the surface of the rock, by the side of the road, was marked with shells; and was kind enough to send me a few specimens, chiefly pectens." Mr. Kaye subsequently visited the locality himself: the fossiliferous limestone he found to appear first at the bottom of a valley near the village of Paroor, seven miles from Verdachellum, and forty from the coast: the high ground between it and Verdachellum consists of the red sand (resembling the red sandstone of Pondicherry,) in which was found a fragment of silicified wood; but the limestone rises into small hills on the opposite side of the valley. Mr. Kaye found in this limestone, Rostellaria, Arca, Pecten, Exogyra, Cardium, Lima, Terebratula, and other shells, which identify it, he thinks, completely with the Ootatoor beds near Trichinopoly, which will be described presently; and in addition a large number of Ammonites, of three or four different species, dissimilar to those of the Pondicherry beds: also portions of Nautili, and a Spatangus, similar to those of Pondicherry. Mr. Cunliffe, Mr. Kaye's zealous coadjutor in these most interesting discoveries, states that the genus Cidaris was numerous at Verdachellum, or rather, Paroor, though, as yet, undiscovered in the Pondicherry beds; and the Baculites of the latter were wanting at Paroor: and not a single chambered shell, save the cast of a single chamber of a large Ammonite, has been found in the Trichinopoly deposit at Ootatoor. Among the Verdachellum fossils were the bones of an *ophiura,* or star fish, which Professor Forbes pronounced to be the best preserved specimen he ever saw from the cretaceous beds.

Too much praise cannot be attached to the indefatigable exertions, zeal, and acumen of Messrs. Kaye and Cunliffe, who have thus established the interesting fact of the existence of cretaceous rocks in Southern India by a series perhaps of the most beautifully preserved fossils that were ever laid before the geological world, embracing many new forms, and some of Cypræa, Cerithium, &c., which were supposed to be peculiar to tertiary strata, but were doubtlessly formed in a cretaceous sea.

---

[1] It is probable that these fossiliferous beds may be traced still further south.—T. J. N.

The Neufchatel beds, *Terrain Néocomien*, and the Neocomian strata of the Crimea, have been referred to the Wealden of British geologists; but by Mr. Murchison they are considered to be the equivalent of the lowest green sand of England, and of the *Hils-thon* of Römer in Hanover. The fossils of the Pondicherry beds will probably throw additional light on this *quæstio vexata.*

TRICHINOPOLY FOSSIL LIMESTONE.

About seventy-eight miles inland from the Bay of Bengal, in the vicinity of Trichinopoly, Lat. 10° 52′ N., and Long. 78° 46′ E., beds of a marine limestone occur, the geognostic position of which has not hitherto been described: though it is supposed they rest immediately on the plutonic and hypogene rocks which surround it.

The fossils brought thence are pelagic, comprising members of the families Serpulacea, Nymphacea (Tellina? Venus?), Cardiacea, and Arcacea, some of which are identical with those of the Pondicherry beds; also, Scalarias, Rostellarias and Turritellas. No Baculites, Hamites, or Nautili have hitherto been discovered, or other shells sufficiently characteristic to identify this deposit with the Pondicherry beds, from which they are distant about 100 miles to the S.W. The cast of part of an Ammonite, and a piece of silicified wood, resembling that of the lateritic deposit covering the marine limestone of Pondicherry, pierced by Teredinés, have been found on the Trichinopoly beds.

The imbedding limestone, though bearing a general resemblance to that of Pondicherry, is usually less crystalline, looser in texture, and darker in colour than that of Pondicherry: and the organic remains in a better state of preservation, and more numerous.

Until more information be obtained, the geognostic place here assigned to the Trichinopoly beds must be merely considered as provisional.

PART V.

FRESH-WATER LIMESTONES AND CHERTS.

We are now arrived at deposits which I have little hesitation in referring to the tertiary epoch. Although the deficiency of rocks of this age, and of the secondary period, forms a remarkable feature in the geology of Southern India, yet that of the former is not so great as has hitherto been generally supposed.

Nirmul Beds.—In the route from Hydrabad towards Nagpore, on the north bank of the Godavery, among the Nirmul Hills, and thence across the Wurda to Hingan-ghaut beyond the limits of our area, Mr. Malcolmson discovered detached beds of chert and limestone, containing shells, the general character of which Mr. Lonsdale considers to be that of fresh-water. The fossils were first found at Munoor, and between this village and Hutnoor, which is near the top of the Mucklegundi Ghaut, and in different parts of this pass leading into the valley of Berar. Mr. Malcolmson describes[1] the bed in which they were first observed to be a band of a singular quartz rock, projecting about two feet from the surface, half-way up the escarpment of the principal mountain, ascending the steep pass leading up the south side of the Nirmul Hills, and which is composed of concentric nodular basalt imbedded in a soft greenish wacké.

The quartz rock is remarkably scabrous, of various shades of white and red, and has cavities on its surface covered with fine silky crystals. Mr. Malcolmson observes, that it had every appearance of having been forced into its present position, when the basalt covered and partially melted the bed to which it belonged. Many fragments of this rock were found below with the shells; and it was again met with, together with the same and other fossils, imbedded in basalt, near Hutnoor. The specific gravity of this rock is 2·473, and some of the specimens effervesced feebly in acids, a portion of lime being dissolved.

The rock in which the fossils occur varies in different places: some of the finest specimens were obtained from a red chert with scabrous surface, having silicified shells distributed throughout its substance, or projecting from its surface. Besides testacea, this red chert contained small portions of silicified wood, and what Mr. Malcolmson considered, though he states at the same time that the specimens were too imperfect to admit of any certainty, to be the fragment of a bone, and of the tooth of a mammiferous animal.

---

[1] Geol. Trans., Vol. V., Second Series, pp. 549, 550.

The finest Unios occur in a beautiful grey chert, imbedded in the basalt, or resting immediately on it. Some parts of the rock exhibit a mixture of sand, clay, and fragments of shells, of very moderate hardness, but the greater part consists of chert, the materials of which are occasionally arranged in a beautiful light blue enamel-like substance, around irregular cavities containing crystals of purple quartz. Some portions also exhibit a minute vesicular structure. Some are composed of a tough white clayey stone so soft as to stain the fingers: these contained Physæ, Paludinæ, and Limneæ, mostly converted into calcedony; but others retained their original structure, and effervesced with acids. Portions of charred vegetable matter, resembling small fragments of grasses and weeds, occur in these and in the harder cherts. Other specimens are composed of a greenish-blue crystalline mass resembling an ore of copper, (but it is of low specific gravity, and contains no trace of that metal,) and the imbedded shells are converted into the most beautiful crystalline quartz, retaining the form of every convolution of the Physæ and Paludinæ. Masses of a hard coarse chert consist almost entirely of Gyrogonites, but contain many of the same Physæ and Paludinæ. This rock appears to have formed beds of about half a foot in thickness; but it was not discovered *in situ.* A stratified rock was however found in the vicinity, consisting of a compact whitish chert, which contained Paludinæ and the finest specimens of Gyrogonites. Night prevented the connexions of this rock from being determined; the strata were, however, ascertained to be of considerable extent, and to be much buried in the soil: there were also numerous fragments of a siliceous rock, partly converted into black bituminous flint, or a coarse quartzose rock, partially altered into calcedony, by which most of the shales were also replaced.

After descending the second terrace a bed of white horizontally-stratified limestone, almost wholly composed of large bivalved Unios (named Deccanensis by Mr. J. de Carle Sowerby, 4 to 8 of description), is met with. The shells are not in very good preservation. Their edges, decomposing more slowly than the cement, jut out in relief. Hence the name of Mucklegundi, or *Bukre ke panw ka putthur,* "sheep's feet stone," applied by natives to the pass and the rock, from the resemblance the shells are thought to possess to the impressions of the feet of these animals in clay. The Unios found in this bed have been identified with those in the chert at Munoor. It also contains a species not yet discovered elsewhere, viz., the Unio tumida? (11 and 12). At the bottom of the little cliff, where the granite is seen to underlie the fossils, very perfect Melaniæ were found in a fragment of a compact argillo-calcareous stone, identical with those in the limestone. The shells are fossilized by compact limestone, imbedded in a matrix consisting of calcareous matter mixed with small fragments of granite, and of a friable, grey, cellular substance resembling ashes, which occurs in situations where the limestone becomes concealed in the basalt, and is apparently imbedded in both rocks. The thickness of this fresh-water limestone bed, in one place where it is intersected by a torrent, is twelve feet, and it rests directly on red granite. The cherts all rest on, or have been entangled in the basalt, and are doubtless nothing more than the metamorphosed limestone; even the calcareous walls of the shells have been converted into silex. The basalt comprising the higher portions of the Nirmul Hills rests on this granite.

I have already transgressed my limits in tracing the course northerly of this interesting series of deposits, which were, probably, once continuous, until broken up, altered, and scattered by that prodigious eruption of trap which covers the greater portion of the Deccan: but I cannot refrain from quoting Mr. Malcolmson's interesting account of the Chicknee and Hingan-ghaut deposits which lie between the Mucklegundi Pass and Nagpore, separated by tracts of granite, blue limestone and sandstone, resembling those of Cuddapah and basalt: inasmuch as a brief description of the manner in which these fresh-water patches are distributed over the great overlying trap, will conduce more than anything else to a true conception of their origin.

Near Chicknee, the schist (viz., the red schist found above the limestone south of the Urjunah hot springs, and in various places of the diamond districts of the south,) rises slightly towards a basaltic ridge, in which the fossiliferous chert is likewise imbedded. The fossils occur on the surface, or are imbedded in nodular basalt, over several miles, being found in blocks of indurated clay, chert, and flinty slate. The appearance of the indurated clay is the same as in some of the specimens from the Sichel (Nirmul) Hills, but the clay is harder, full of cavities, and, in some cases, passes into perfect chert, or has waved lines of quartz or opalized matter diffused through the substance of the mass. Many Physæ, Paludinæ, and a few Limneæ, of the same species as those already noticed, are found in this indurated clay, or imperfect chert. Some of them are entirely converted into calcedony; others have the lime replaced by quartz, which is finely crystallized and covers the surface of the convolutions; or the columella only is preserved, passing across an empty cast of the shell. In some cases, however, the structure of the fossil is unaltered, and it effervesces in acids.

Flinty slate without organic remains occurs in the neighbourhood of these amorphous masses, and many fragments of the same kind, containing large compressed bivalves, are scattered about. In one block of this kind, portions of palm wood mineralized by black flint, intersected by fine veins of a light blue opal [of the same kind as occurs in some of the specimens of fossil wood from Antigua, by Mr. Stokes], was found associated with compressed very thick bivalve shells, probably referable to the same species as those of Munoor. At Hingan-ghaut, a few miles further to the north, considerable fragments of silicified palms and other plants were found in a black chert lying on the basalt, and similar masses, but without fossils, were imbedded in it. No organic remains were met with between this place and Nagpoor, the whole of the country being covered with a rich black soil, from which insulated basaltic hills with flattened summits rise abruptly.

In examining with the microscope sections of some of the silicified wood from the chert of Hingan-ghaut, one appeared to Mr. Malcolmson to be bone, which was examined by Professor Owen, who gives the following note:—"A section of this fossil was prepared sufficiently thin to allow of its being examined by transmitted light under a high magnifying power, when it was found to possess the structure characteristic of bone. Sections of 'Haversian Canals,' with their concentric lines, were everywhere present, interspersed with numerous Purkingian cells, or corpuscules: the size and disposition of these characteristic parts of the osseous structure agreed with those of the bones of the mammalia. It was highly satisfactory to find the microscopic test as available in demonstrating the presence of bone, when ordinary characters and the unassisted eye would have left the matter doubtful, as it is in reference to the determination of the teeth."

The silicified wood of these deposits appears to be chiefly palms; no specimens of dicotyledons are mentioned. The shells and charæ have been engraved and described by Mr. J. de Carle Sowerby as follows:—

1. *Chara Malcolmsonii.*—Oblong, spheroidal, with ten ribs; three of the ribs are produced at the apex. Natural size, and magnified.

This capsule is composed of five tubes, each of which is curled twice round. The figures represent a cast of the interior, the tubes being split down, and the outer halves broken away and left in the chert. The specimens are silicified, and constitute almost the entire mass of the rock, in which they occur associated with Physæ and Paludinæ.

2. *Cypris cylindrica.*—Twice as wide as long, almost cylindrical;

front very slightly concave; the outer surface, which is very rarely obtained, is punctured.

3. *Cypris subglobosa.* — Subglobose, triangular, inflated; front concave.

The outer surface of this crustacean is punctured as in *C. cylindrica.*

Both species occur abundantly in grey chert, with the *Unio Deccanensis* and other shells; and in various specimens of chert and indurated clay, containing *Gyrogonites*, *Paludinæ*, *Physæ*, and *Limneæ*, from the Siehel (Nirmul) Hills. The fossils are converted into calcedony.

4 to 10.—*Unio Deccanensis.*—Transversely oblong, rather compressed; margin internally waved; shell very thick; surface finely striated. Fig. 6 is in limestone from the northern descent of the Sichel (Nirmul) Hills; the others are in chert from Munoor. Natural size.

This species has often a ridge, which bounds the posterior portion, and is variable in size and elevation. It is most conspicuous in the limestone specimen, fig. 6, and in a cast in chert from Munoor, fig. 7. Fig. 8 is possibly a very young individual, before the margin had assumed its wavy form. Fig. 9 is from a part of a group of many individuals of nearly one size, badly preserved in the same limestone as fig. 6; but as they are generally oval, and do not show a waved margin, they may belong, as well as fig. 10, which is in grey chert from Munoor, to a species distinct from *Unio Deccanensis.* Some flattened specimens from this limestone are two and a half inches broad.

11 and 12. *Unio tumida.*—Transversely obovate, smooth, gibbose; posterior extremity rather pointed; beaks near the anterior rounded extremity. Natural size.

The section of the two valves united is regularly heart-shaped. The shell is rather thin, and it has something of the contour of *Cyrena.* It occurs in the same limestone with fig. 6, and the substance of the shell is replaced by calcareous spar, which cannot be broken so as to show the hinge.

13. *Limnea subulata.*—Subulate, elongated, smooth; spine equal in length to the body; whorls five. In a nearly white, soft, siliceous stone, from Munoor and Chicknee. Natural size.

14, 15 and 16. *Physa Prinsepii* (so named after the lamented J. Prinsep).—Ovate, rather elongated, smooth, spire short; body whorl largest upward. Fig. 16 in a soft siliceous stone from Munoor. Fig. 14 in chert from Munoor, and fig. 15 in chert from Chicknee; the drawing represents the shell as wider than it is. Many of the specimens are crushed. The largest, fig. 15, are two and a half inches long and upwards of an inch broad. Natural size.

17 to 19. *Melania quadri-lineata.*—Subulate, whorls about eight, with four striæ upon each; aperture nearly round. Fig. 17, in grey limestone from the same locality as 6 and 11. Fig. 18, in softish chert from Chicknee, associated with *Physa Prinsepii.* Fig. 19, in fine reddish grey chert, protruding from basalt near Munoor, appears rather shorter in form than the others, but the spire is not perfectly exposed nor entire. Natural size.

20 to 23. *Paludina Deccanensis.*—Short, conical, pointed, rounded at the base; whorls five or six, slightly convex, aperture round. Fig. 21 is in chert from Munoor; and figs. 20 and 22 in indurated clay from between Munoor and Hutnoor, the cavity of the shells being filled with calcedony. The young shell has a slight carina, shown in fig. 20. Fig. 23 appears to be a crushed specimen; it is in laminated, indurated clay, Munoor. This shell occurs, with *Physa Prinsepii,* in a beautiful green siliceous mineral at Munoor, at Chicknee, and at the bottom of the Nirmul Pass. All the specimens natural size.

These shells all belong to fresh-water *genera,* and to species which have not yet been discovered recent. The charæ, too, have not yet been found in the fresh-waters of India.

Similar beds of limestone and chert are scattered over the whole of the overlying trap region, and on its borders, in thin and circumscribed patches, and separated by distances often considerable, but imbedding similar fresh-water shells. Voysey[1] observed a stratum of earthy clay of different degrees of induration, twenty yards in length, and about two feet thick, containing a great number of entire and broken shells.

Near the summit of the table land of Jillan, in a pass ascending from the valley of the Taptee, or Berar, which separates the Gawilghur trap ranges from those of Nirmul, or Sichel, the shells are much compressed, and their structure seemed to Voysey to have been depressed by an overlying mass, fifteen feet thick, of the nodular basalt or wacké on which, too, this shell deposit rests. The vertical fissures, so remarkable in trap rocks, are prolonged from both the upper and lower rocks into the shelly stratum, although there is no intermixture of substance. The casts and fragments of the shells resemble those of the Paludinæ and other shells of the Nirmul Hills already described. Voysey discovered shells in an indurated fossiliferous clay near Nirmul and others in a siliceous rock containing lime, resembling in every respect the fossiliferous cherts of the Nirmul Hills, and like them imbedded in basalt, on the insulated hills of Medcondah and Shivalingapah, which rest on granite, south of the Godavery, near the south border of the great overlying trap, and also in the hills of Bicknoor-pett and Nugger.

---

[1] Asiatic Researches, Vol. XVIII., page 192, and Journal of Asiatic Society of Bengal, Vol. II., p. 304.

Mr. Malcolmson[1] found in a specimen of the chert from Medcondah, in the Museum of the Geological Society, a Gyrogonite of the same kind as those of Nirmul, and halves of a species of Cypris associated with shales.

Dr. Spilsbury found, eighteen miles from Jubbulpoor, in the valley of the Nerbudda, blocks of "indurated clay," associated with the trap, containing casts of fossil shells, for the most part siliceous, and resembling those found by Dr. Voysey in the Gawilghur range on this side the valley. At Saugor, nearly one hundred miles to the north-west, reversed shells, stated to be exactly the same as those of Jubbulpoor, were discovered by Dr. Spry in a bed of limestone covered by seventeen feet of basalt, and resting on a coarse siliceous grit, underlying which the basalt again occurs. Fine specimens of silicified palm wood occur in the vicinity, as well as fossil bones of mammalia in a limestone capped by basalt. The drawings of the shells, Mr. Malcolmson observes, differ a little from each other, but the fossils are stated to be the same; and, as far as Mr. Sowerby could judge, they do not differ from the *Physa Prinsepii.* The similarity was more obvious in other specimens left in India.

South of the Nerbudda, fossils are again met with in the mountainous country north of the sources of the Taptee, at a place called Jirpah, near to which trap hills have broken through the sandstone.

Hydrabad Beds.—Between Beder and Hydrabad, on the south edge of the overlying trap, I found, in 1839, loose blocks of a greyish white limestone imbedding a few fragments of univalve and bivalve shells in so comminuted a state as not to be recognizable. The limestone in lithologic character closely resembles some varieties of the fresh-water limestone of Nirmul, and is equally broken up by the overlying trap. The blocks were partially converted into chert, and half buried in the soil covering the trap on which they rested. Thence, following the edge of the overlying trap in a south-westerly direction towards Bijapore, as it skirts the plutonic and hypogene rocks of the south to the valley of the Bima, between Muctul and Gulberga, another bed of fresh-water limestone occurs, extending from the vicinity of Koolkoondah northerly to Digaye, where it rests on blue non-fossiliferous limestone, which disappears under a great coulée of trap on the opposite bank of the Bima, between it and Gulberga. The specimens brought me by my friend Captain Wyndham contained only one description of shell, the *Paludina Deccanensis.* Still further to the west and near Ingliswara large blocks of the whitish grey siliceous limestone occur entangled in, and broken up by the trap, but I did not find they contained any fossils. It has in many situations been converted into chert and jasper, it is harsh and trachytic to the feel, and has an irregular sparry fracture; it usually appears on the sides and summits of hills, projecting in rough scabrous masses from the surface, easily distinguished from the dark trap. A similar limestone is noticed by Captain Coulthard[1], on the north-east side of the great trap region.

---

[1] Transactions Geological Society, Vol. V., Second Series, pp. 570 and 571.

The only other described deposit of fresh-water shells is that about five miles south-west of Puddpungallee, which is ten miles south-west from Rajahmundry on the Godavery, a little above its delta. They occur in limestone, both underlain and capped by trap, evidently an outlier of the continuous trap formation so often alluded to in the account of these beds. Here, however, the deposit must have been in an estuary, or lake communicating with the sea; since Dr. Benza states[2] that among the *Limas* and *Melaniæ* he found oysters. They occur in a hill elevated about 300 or 400 feet above the plain in which it is situated, about fifty miles inland from the present coast line. The base of this hill as well as of the plain is of a red conglomerate sandstone, (evidently identical with the diamond conglomerates of Malavelly, Cuddapah, &c.,) resting on a grey non-fossiliferous limestone, seen in a lower situation nearer the Godavery; over the conglomerate is a layer of wacké with jasper, which continues about midway up the hill, where it is succeeded by a thick bed of the shell limestone capped by wacké and basalt. According to Dr. Benza, the limestone protrudes in a little ridge, a foot or two raised above the side of the declivity, running some hundred yards east and west, and cutting the hill in a direction parallel to its base, appearing to be vertically situated. The outgoings of this bed are tufaceous, as well as the surface of the implanted blocks all around it, and in which the fossil shells were clearly distinguishable; but when fractured deep exhibits a compact texture, a whitish colour verging to yellow, and a fracture semi-conchoidal and glimmering, on account of the numerous crystals of carbonate of lime, into which all the fossil shells are converted. It sometimes abounds with small cavities lined with calc-spar, and exhibiting only the impression of the shells, their substance having been absorbed. Loose blocks of the shell limestone are scattered about the nullahs and on the declivity of the hill; others implanted in the soil.

---

[1] Asiatic Researches, Vol. XVIII., Part I., p. 59.

[2] Madras Journal of Literature and Science for January, 1837, pp. 50, 51.

The basalt is both compact and vesicular; sometimes approaching amygdaloid, the cavities often lined with calc-spar; the wacké underlying the limestone is veined with jasper, occurring also in beds and thin ramifications, which, in consequence of the wacké's easily weathering, are scattered about the surface. These jaspers and wackés exactly resemble those of the overlying trap. Most of the shells have evidently undergone violence, or compression, being fractured, and many of them reduced to small fragments. Some of the masses of the limestone are entirely composed of shell, converted into brilliant and sparry crystals of carbonate of lime.

The top of the hill forms a kind of table land capped with globular basalt decomposing in concentric layers, and extends apparently a few miles eastwardly. The loftier hills to the east of this, according to General Cullen, are of a similar formation; and as they present deeper nullahs, vertical escarpments and precipices, better opportunities would be afforded of observing the geological position of the strata. But of this interesting range no published account has been yet given. General Cullen has the merit of having discovered this deposit.

PART VI.

LATERITE.

Geographical Position and Extent.—Laterite occupies a larger portion of the superficies of Southern India than has been commonly supposed. The western coast is almost continuously covered by a sheet of this rock, extending, usually, inland to the very base of the Ghauts; and from the south of Bombay to Cape Comorin. Thence along the east or Coromandel coast it occurs in detached beds; the most considerable of which are those composing the Red Hills near Madras, Nellore, vicinity of Rajahmundry, Samulcotta, and into Cuttack.

It is found capping the loftiest summits of the Eastern and Western Ghauts; and of some of the isolated peaks on the intervening table lands. On those of the northerly parts of our area it appears in more continuous, and extensive sheets; often forming long low ranges of flat-topped hills, resembling in contour those of the horizontal sandstone and overlying trap formations. The laterite bed of Beder, in Lat. 17° 55′ N., and Long. 77° 34′ E., is about twenty-eight miles unknown in Europe, is not confined to the Eastern peninsula of India, but extends as a fringe, with more or less interruption, to the shores of Birma, Malacca, Siam, capping many of the granitic mountains in the interior. I have seen it on the coast of Sumatra, and on many of the islets in the Straits of Malacca, invariably occupying the same overlying position. It occurs also in Malwa, many parts of Bengal, and in Ceylon.

Physical aspect.—Lateritic districts have frequently been reproached for the sterile aspect they usually present. This arises chiefly from the too ferruginous or siliceous character of the rock, its porous structure, which does not admit of retention of moisture, and the property it possesses of hardening on exposure to the atmosphere. The soils formed by the weathering of the soft and argillaceous varieties of laterite are fertile, and produce abundant crops of rice, and of the dry grains that ripen in the early part of the season. Hills of laterite are usually distinguished, as before observed, by their long, low, flat-topped character, assimilating those of the trap and horizontal sandstone formations. The lands they support are, however, not so much furrowed as those of the sandstone by water channels, a circumstance ascribable to the drainage passing rapidly off through the pores of the rock. When capping detached rocks, the laterite usually imparts to the whole mass a dome-shaped or mammiform outline, or that of a truncated cone.

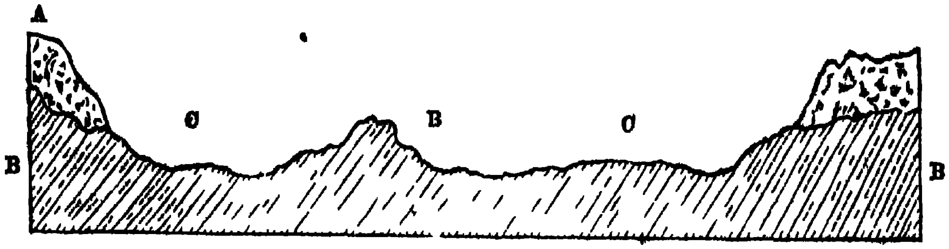
On the surface of table lands it is spread out in sheets, varying from a few inches to about 250 feet in thickness, terminating on one or two sides in mural escarpments.

Immense detached blocks, generally of a cuboidal shape, are often seen occurring on the flanks of the Western Ghauts, and on the southern slopes of the Sondur hills, often separated and dislodged; the valleys intervening between ranges of laterite hills are generally winding like those formed by the course of a stream, and flat-bottomed; particularly in districts where it overlies the newer trap.

From a general survey of its localities and position on the superfices of Southern India, it seems probable that the laterite extended over it far more continuously than at present; and that it owes much of its frequently insulated position to denudation,—the vestiges of which are clearly traceable in extensive tracts of lateritic gravel and debris, which are often re-aggregated; and it requires great care and observation not to confound such deposits with the true laterite beds from which they have been derived. As the land slowly emerged from the waters of the ocean, the process of denudation went on hand in hand with that of upheaval in laying bare the subjacent plutonic, hypogene, and trappean rocks. From the contour of the peninsula, and its general slope to the east, it is evident that the Western Ghauts must have first appeared above the surface, and the land to the east of this great chain by subsequent gradual efforts; the Coromandel, or eastern coast, probably appearing last. Hence the continuity of the lateritic zone is much more interrupted on this than on the western coast, where the elevation was at a much greater angle; as the course of the retiring waters of denudation must have followed the easterly direction of the present great lines of drainage.

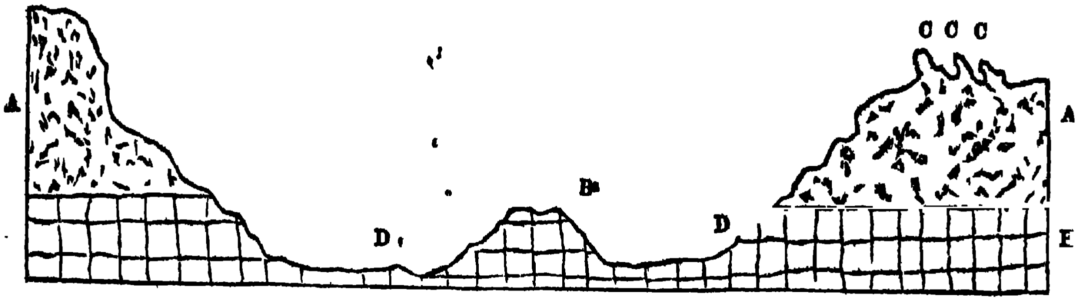
Natural sections often remind one forcibly of that striking instance of denudation of the red sandstone on the north-west coast of Ross-shire, given by McCulloch[1]. The following section, No. 1, is taken on the western coast of India, between Honawer and Sedashegur. No. 2 is from the cliffs of Beder, on the table land of the Deccan.

No. 1.



A A Beds of laterite once continuous, capping B B.
B B B Gneiss and hornblende schist.
C C Denuded space.

No. 2.



A A are cliffs of laterite from 90 feet to 120 feet high, once continuous.
B B Overlying trap and amygdaloid.
C C C Hard ferruginous masses of laterite: though evidently much water-worn, they have successfully maintained their position against the transporting effects of the stream, which not only stripped off the laterite, and denuded the subjacent trap, but excavated the latter to the depth of many feet, leaving the hard mass of trap B^2 in the centre, and the valley of denudation and excavation D D.

The valley runs east by south, and over the plain at its eastern extremity are scattered the hard nodular fragments of the stripped-off laterite from D D, mingled with *regur* and the recent alluvium of the laterite rocks. No causes now in action could have effected these denudations.

---

[1] Western Isles, Vol. II., page 93, plate 31, fig. 4.

Stratification and Dip.—Laterite usually occurs in tabular masses, which like the thick-bedded sandstones present no appearance of stratification. Where, however, the laterite loses its cellular structure, and takes the character of a sandstone or conglomerate, its true bedded structure is obvious. I have never seen its dip vary much from the horizontal.

Lithologic Character.—This rock derives its name *Lateritis,* (bestowed on it by Francis Buchanan,) from its being cut into the form of bricks, and used as such by the natives, who term it often in their own dialects the brick-stone. Buchanan[1] identifies it with the *Argilla lapidea* of Wallerius.

The laterite varies much in structure and composition; but, generally speaking, it presents a reddish brown, or brick coloured, tubular, and cellular clay, more or less indurated, passing on the one hand into a hard, compact, jaspideous rock, and on the other into loosely aggregated grits or sandstones, as at Beypoor near Calicut, Pondicherry, &c., and into red sectile clays, red and yellow ochre, and white porcelain earth, plum-blue, red, purplish, and variegated lithomarges. Sometimes it presents the character of a conglomerate containing fragments of quartz, the plutonic, hypogene, and sandstone rocks, and nodules of iron ore derived from them, all imbedded in a ferruginous clay.

The cavities are both vesicular, tubular, and sinuous; sometimes empty, but, in the lower portions of the rock, usually filled, or partially filled with the earths and clays above-mentioned, or a siliceous and argillaceous dust often stained by oxide of iron. A species of black bole, carbonized wood, and carbonate of lime, sometimes occur, but rarely, in these cavities. Minute drusy crystals of quartz not uncommonly line the interior.

The walls separating the cavities are composed of an argillo-siliceous paste, often strongly impregnated with iron, and frequently imbedding gritty particles of quartz. The oxide of iron prevails, sometimes to such an extent as to approximate a true ore of iron, and the nodules are often separated and smelted by the natives in preference to using the magnetic iron ore, which is more difficult to reduce, from its greater purity. When the whole mass is charged with iron, and very vesicular, (not unfrequently the case,) it might easily be mistaken for iron slag. The colour of the *parietes* separating the tubes and cells, which in the less ferruginous varieties is a light brick red or purple, changes into a liver brown; having externally a vitrified or glazed aspect; while the surface of the interior cavities puts on iridescent hues. The walls of these cells are sometimes distinctly laminated.

---

[1] Journey through Mysore, Canara, and Malabar, Vol. II., pp. 436 and 440.

The specific gravity varies, as may be supposed from what has just been said. Many average specimens of the laterite of the Malabar coast I found to range between 2· and 3·2; that of the laterite of the Malay peninsula was found by Dr. Ward to be 2·536.

Before the blow-pipe the walls of the cavities melted into a black shining glass powerfully attracted by the magnet. The brown paste and ochreous dust contained in the cells did not fuse, but were converted into a cineritious slag less powerfully attracted, whilst the reddish and purplish portions hardened and remained almost unchanged beyond exhibiting scattered minute magnetic globules, having a dark metallic lustre.

The air exposed surfaces of laterite, as previously remarked, are usually hard, and have a glazed aspect, and the cavities are more empty than those in the lower portion. A few inches or more below the surface the rock becomes softer, and eventually, as it descends, so sectile as to be easily cut by the native spades, but hardens after exposure to the atmosphere. Hence it is used largely as a building stone in the districts where it prevails, and to repair roads. From its little liability to splinter and weather, (time appears to harden it,) it is a good material in fortifications; for which, and in the construction of their early churches, it has been largely used by the Portuguese on the western coast, and in their settlements to the eastward. The Arcaded Inquisition at Goa was built of it, and the old fortress of Malacca. The angles of the blocks of laterite in the remaining portions of these massive structures are as sharp and perfect as though the block had been separated from the rock but yesterday, although upwards of three centuries have elapsed.

The accumulation of the clays and lithomargic earths in the lower portions of the rock, which absorb some of the moisture percolating from above, renders the mass soft and sectile. These earths, doubtless, existed once in the upper cavities of the rock, from which they have been gradually removed to the lower strata by the downward action of the water of the monsoon rains. They accumulate at various depths from the surface and form impervious beds, on the depressions of which he water collects, forming the reservoirs of the springs we often see oozing, as at Beder, and many localities on the Malabar coast, from the bases and sides of lateritic hills and cliffs. Some of the tubes and cavities are *culs de sac*, and do not part with their contents, but the generality have communication with those below them, either directly or indirectly. The downward action of the water, by working through the thinner *parietes*, has tended to improve this communication: for we find in the laterite cliffs of Beder, where a horizontal layer of impervious matter occurs in the substance of the rock, that the sinuous tubes in the laterite immediately above it, have been diverted from their usual obliquely downward direction, to one nearly horizontal, showing that the water, on arriving at this obstruction to its progress downwards, spread itself laterally and horizontally over its surface.

In the same cliffs empty sinuous tubes, having a generally vertical direction, are observed, varying from a few lines to two inches in diameter, and passing from the surface of the rock to considerable depths in its substance. One was traced thirty feet until it disappeared in a projecting portion of the cliff.

They occur on a still greater scale, forming caverns of great extent, if we believe one tenth part of the native traditions regarding them. Such is the cave shrine of Sheikh Furreed at Cuddry, about two miles from Mangalore[1]. This is a hole in the centre of the side of a perpendicular rock composed of laterite, which is said to lead all the way to Hydrabad, 450 miles! The opening is square, about six feet above the ground, ascended by a flight of stone steps, just large enough to allow a person to crawl in. The cavern is very dark, and no one knows the exact size of it. Adjoining is a chasm in the rock, and of inconsiderable size, which at its entrance has been built up with stone, and an opening left for people to creep in by, as in the other; but this is found open within (or exposed to the air) after it is once entered. More than a century ago, a Mahomedan recluse, named Sheikh Furreed, took up his abode in the cave, and at the expiration of twelve years disappeared, and has never been heard of since. The popular tradition is, that he tried to get to Mecca by this subterraneous route!

There is another cavern of considerable size, in the laterite cliffs cresting the Sondur Hills, on the table land of the Ceded Districts, into which I penetrated a considerable distance; but not being provided with torches was compelled to return. The entrance was of an irregular oval form, not exceeding six feet in height, and bifurcating a few paces from the entrance into two winding galleries, leading obliquely downwards into the bowels of the rock. The floor is broken by rugged step-like descents. The cavern drips with water, and swarms with bats, hosts of which were disturbed by my intrusion. Its floor is formed of lateritic detritus, covered with the filth of bats,

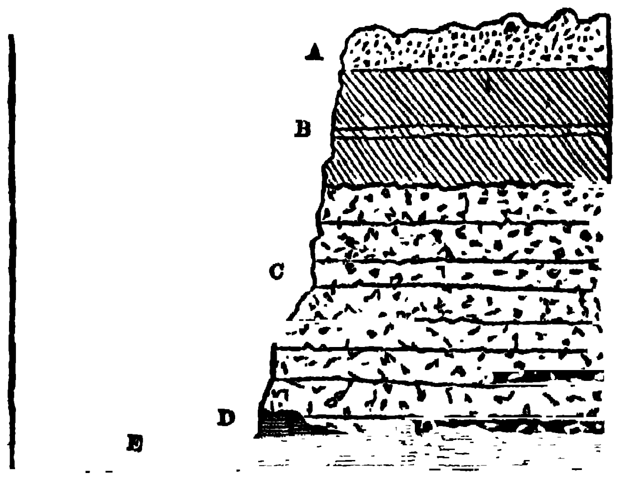
---

[1] Dr. Herklot's Qanoon-i-Islam. Glossary, pp. LXIX and LXX.

General Cullen recently writes me that lignite occurs in other localities in the laterite of Travancore, and that graphite in scales seems to be rather common in it; chiefly conspicuous in the laterite about Trivandrum and Quilon. It occurs still further south in large and thick scales, and disseminated very generally also in a kind of laterite close to the foot of the mountain, about twenty-five miles east of Trivandrum.

In 1840, I discovered a bed of lignite with resinasphalt, sulphur, alum, (the result of decomposing iron pyrites,) and mineral copal, near Beypoor in the vicinity of Calicut on the Malabar coast, in a bed of loose sandstone, into which the laterite passes, on the right bank of the river, immediately imbedded in layers of black carbonaceous and aluminous shales and clays containing scattered spangles of mica.

The following is a section of the beds, which rise about forty feet above the river's then level.



A Sandy alluvial soil.
B Loose lateritic sandstone with beds of ochreous earth.
C Gritty sandstone passing into laterite; variegated in its lower portions with red and yellow bands.
D Stratum of black aluminous shale and clay imbedding the lignite, &c.
E Level of the river.

The beds dip conformably at an angle of four degrees towards the north-east. The lignite bed can be traced about half a mile easterly up the river where it dips below the river's level. Its structure is obscurely stratified, crossed by vertical fissures, surfaces of which are frequently covered with a yellowish efflorescence, consisting of sulphur, iron, and alumina; sulphur, and oxide of iron, also occur uncombined. The carbonized branches, leaves, and trunks lay horizontally in the black shale. Some were fibrous, toughish when struck by the hammer, and heavy, resembling wood recently charred: others were brittle with a resinous fracture and lustre, resembling bitumen. Many fragments were penetrated with water, holding iron and alum in solution: the former of which appeared on their surface as a glittering reddish-brown coating. The woody structure was, in general, sufficiently distinct to show that the principal trees imbedded were dicotyledonous. Impressions of leaves and stems of plants were abundant between the layers of shale; but I did not observe any of the dicotyledonous seeds which occur in the lignite beds of Travancore. Some were perfectly black; others of different shades of brown exhibiting different degrees of carbonization. A portion of a black carbonized leaf burnt slowly with a slight flame into a reddish ash, white on the edges. This being subjected to the reducing flame melted on its edges partly into a greenish enamel, and partly into a dark slag affected by the magnet.

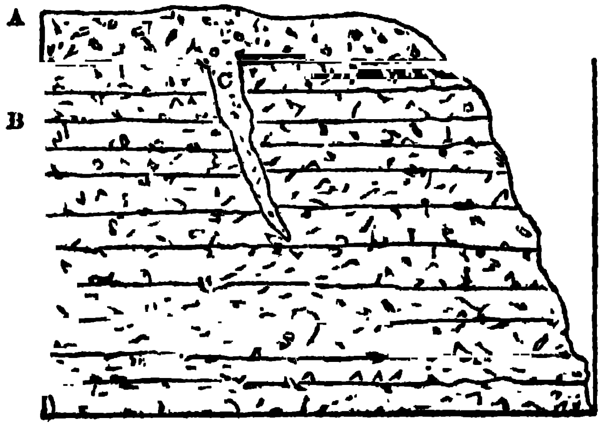
The imbedding black shale decrepitated slightly before whiteness, emitting an odour like that of burning coal. It finally fused on the edges into a light greenish-grey enamel, slightly magnetic. The most resinous portions of the carbonized wood burned with a clear flame and bituminous odour, into a white ash: while those in which the elasticity of the woody fibre was less impaired, scarcely gave out any flame at all, burning into a reddish-brown cinder. The odour emitted, however, resembled that of coal more than that of burning charcoal. The cinder fused before the blow-pipe, after giving out two or three bubbles of gas, into a black slag readily attracted by the magnet. The yellowish cauliflower-like efflorescence on the surface of the carbonaceous bed emitted distinct fumes of sulphur on being subjected to the oxidizing flame; melting, after considerable gaseous extrication, into a dark cinnabar-red globule, which, on being subjected to the reducing flame, was converted, with diminution of bulk, into a black magnetic slag.

The change of colour and driving off the carbonaceous matter by heat, tended greatly to develope vegetable character, fibre, &c., where none was before apparent, or very obscurely so. The specific gravity of the heavier portions is 1·270, slightly exceeding the average specific gravity of coal, which is 1·250. This deposit of vegetable matter has evidently been made tranquilly, from the flat horizontal position of the layers of leaves and stems.

Since writing the above, General Cullen informs me that he now sees much of the carbonaceous deposit in Travancore, and that it is very extensive. It exhibits itself in beds of black clay and lignite, of from fifty to sixty feet thick, in some places 200 feet, along the laterite cliffs at Venkully, for a distance of three miles; in fact, all along the coast from Quilon to Venkully. Deposits of the same kind occur about the same level, at the distance of two or three miles inland. A similar deposit is seen on the sea shore, about thirty miles south of Trivandrum. The trunks, or rather their fragments, were both of monocotyledonous and dicotyledonous wood in a state of perfect carbonization, and abounded with sulphuret of iron.

Origin.—Writers on Indian geology are divided in opinion as to the origin of laterite. With regard to the igneous theory as originated by Voysey, taken up by Calder, and put forth by Mr. Conybeare, it must be remarked that, hitherto, no decided volcanic product has been discovered in laterite, no crater or other proof of such origin. It is true, it is frequently seen overlying trap rocks; but it also overlies granite, hypogene strata, sandstone, and limestone, and in none is it ever seen as a dyke; nor are there any signs of forcible intrusion or alteration. In one hand specimen that fell under my observation, the laterite *appeared* to have intruded into and shattered the sandstone; but in every instance where I have had an opportunity of seeing veins, if they may be so termed, of the laterite in other rocks, *in situ*, they have occurred as deposits *from above*, into pre-existing chinks of the subjacent rocks, like the conglomerate which fills fissures in the limestone of Petit Tor; and never injected from below, as is the case with volcanic rocks.

The following section exhibits the laterite filling a chink in the subjacent sandstone of Ganjicotta, in the Cuddapah district.



A Laterite capping sandstone.
B Sandstone.
C Chink in sandstone filled by laterite from above.

Fragments of trappean, and other rocks, occasionally are imbedded in the laterite; as also in the subjacent sandstone, and in other rocks confessedly of aqueous origin. Cases occur where basalt underlying the trap as at Beder, has the appearance of passing into it: but this, on minute examination, turns out to be a confused blending of the debris of both rocks near their junction; from which distinct and unmixed fragments of either sort could be separated, like bits of granite from the breccias that are usually found near the junction of the latter with sandstone. In many localities, however, the line of demarcation between the laterite and overlying trap is clear and decided.

Some geologists suppose that laterite is nothing more than granitic, hypogene, and trappean rocks weathered *in sitû*. The facts of its imbedding erratic fragments of sandstone, at the Red Hills near Madras, where it rests on granite, and its interstratified beds of lignite and silicified wood, militate strongly against this theory. Besides, nothing is more common in lateritic tracts than to see a hill of granite, trap, or hypogene rock, capped with a thick crust of laterite; while the adjacent hills, composed of an exactly similar rock, and forming a continuation of the same bed, equally exposed to the action of the weather, are quite bare of laterite. I have examined many beds of it resting on trap, and amygdaloid imbedding calcedonies, heliotrope, and jasper, but have not hitherto detected in the upper or middle beds of the former, any fragments of these hard siliceous minerals, which are found to resist successfully the attrition of the most rapid streams of India, and have been carried by them across the peninsula to the ocean.

I have seen laterite, too, resting on limestone, without any traceable lime in its composition: and containing veins of manganese, when resting on a trap in which hitherto the existence of this mineral has not been detected: facts, proving that the overlying laterite was not the upper portions of these rocks weathered *in sitû*.

I have often observed, particularly in the Western Ghauts, and on the Malabar and Concan coasts, where the rains fall heaviest, those granitic, hypogene, and trappean rocks, which contain most iron, weather into ferruginous and coloured clays, that sometimes lithologically speaking, resemble laterite; and, when that rock is near, have *the appearance* of passing into it. I have also observed large beds in gneiss and hornblende schist, of an impure oxide of iron, assume a cellular and pisiform aspect; but such must not be mistaken for the true laterite, nor yet the beds of re-aggregated gravel derived from the laterite.

When we look up from the microscopic view afforded by these slowly weathering blocks of rock and beds of ore, and cast our eyes upon even the present extent of laterite over the surface of India, the thickness of its beds, its flat-topped ranges of hills, and the gaps effected in their continuity, evidently by aqueous causes no longer in action, its occasionally imbedding waterworn pebbles of distant rocks, its often elevated position above the present drainage level of the country, its beds of lignite and silicified wood, we find no more reason for attributing its origin to the weathering of rocks *in situ*, or to their detritus transported by causes now in action, than for attributing the formation of the older sandstones to the present disintegration of the granitic and hypogene rocks, of the detritus of which they were doubtless, as well as the laterite, formed originally.

The supposed non-fossiliferous character of this rock, which has puzzled many geologists, and inclined others to the theory of its ancient or volcanic origin, may in some measure be attributed to its highly ferriferous nature, often approaching that of an oxide of iron. It is a general fact, and, as Lyell observes, one not yet accounted for, that scarcely any fossil remains are preserved in stratified rocks in which the oxide of iron (derived from the disintegration of hornblende or mica) abounds: and when we find fossils in the new or old red sandstones of England, it is in the grey, and usually calcareous beds that they occur. It is well known, too, that some of the more recent tertiary deposits of Europe are entirely divested of fossils.

As this singular variety of ferruginous clay and sandstone has not been mentioned by geological writers on other countries than those I have alluded to, it may be presumed that laterite either does not exist under this form at all, or in such small patches as not to have attracted remark. The question naturally suggests itself, why this cellular rock should be confined to India, &c. The solution may be in the highly ferriferous nature of the plutonic, trappean, and hypogene rocks, from which the laterite has confessedly been derived, and in the supposition of a segregation and subsequent re-arrangement of the different mineral particles in the substance of the rock itself, by a process in nature's laboratory, approaching to crystallization, better known than explained or understood. If electricity, which is probable, has any share in exciting this movement and attraction in the mineral particles of the rock, its metallic nature affords a favourable condition for the active development of this powerful agent. The structure of the rock has received some modification from the action of water, in emptying its cells and carrying their contents to the lower parts of the beds.

Age.—Having said thus much to warrant the classification of laterite among rocks of an aqueous and mechanical origin, I shall proceed to remark that in age, relatively to other rocks of Southern India, it is older than the *regur* and *kunkur*, which it underlies, and of more recent origin than the overlying trap, the shell limestone of Pondicherry, and the diamond sandstone and limestone, on all of which it is superimposed. It has never been invaded by the dykes of trap that penetrate the latter rocks—the hypogene and plutonic rocks,—fragments of all which it sometimes imbeds, but is evidently contemporaneous with the efforts, or series of efforts, by which the Western Ghauts were lifted above the waters; since it is seen capping their summits, often shattered into large irregular blocks, and stretching more continuously, and with less signs of disturbance, from their base to the sea.

From the non-altered state of the laterite at its junction with the granite, and the imbedded fragments of the latter rock, as well as of fragments of the trap dykes, it may be inferred that both granite and the associated trap dykes were elevated in a solid state. I have classed the laterite as more recent than the Nirmul fresh-water cherts and limestones, on account of the latter rocks having been invaded and altered by trappean intrusion.

PONDICHERRY SILICIFIED WOOD DEPOSIT.

A short distance inland from Pondicherry beds of a loose ferruginous grit rise into a low range of hills, called, from the colour of the rock, the Red Hills. They run in a north-north-east direction, almost parallel with that of the coast. They are about two miles in breadth, and about eight or nine in length. The deposit, probably, extends further in a southerly direction than the north bank of the Ariacoopang river, to which I traced it from the vicinity of Camlaput on the north. The locality where the silicified wood is found in greatest abundance is in the vicinity of Trivicary, about fifteen miles west of Pondicherry. Between the Red Hills and the sea extends a plain covered with an alluvial sandy soil, and underlying it a greyish-black or dark clayey loam, resembling that of Madras, imbedding fragments of grit and recent pelagic shells. The descent from the hills towards Pondicherry is gentle, but steeper on the western flank, where the strata have been evidently stripped off, and the subjacent fossiliferous limestone denuded[1], leaving a shallow valley, marking the discontinuity of the strata, between this point and where the beds again appear in the vicinity of Trivicary, on the opposite or western side of the valley.

Here they form a low broken range of hills, not rising higher than from fifty to one hundred feet above the general level of the plain, having a parallel direction with the beds on the eastern side, and sloping gently towards the east. The western flank is rugged and precipitous wherever it meets the hornblende schist, which flanks it to the west, near the village of Trivicary. A narrow valley marks the junction line, covered with the detritus of both rocks. Here silicified trunks of trees have been imbedded in the grit in a nearly horizontal position. The stems are both strait and crooked, generally without roots or branches; though the former have been found, and the places of the insertion of the latter are frequently strongly marked on the stem. They are monocotyledonous, and dicotyledonous; coniferous, and non-coniferous. Dicotyledonous wood is, however, most abundant. One of the trunks I found to measure twenty feet in length, and from one to two and a quarter feet in diameter.

---

[1] Vide Section accompanying description of the shell limestone of Pondicherry, p. 214.

Lieutenant Warren, in the Asiatic Researches, describes a trunk about sixty feet long, and from two to eight feet in diameter: but this has been broken up by the native collectors of petrifactions. The organic and microscopic structure of the wood, in many specimens, is beautifully preserved. The siliceous matter of petrifaction is often semi-transparent, like chert, or calcedony, or opalized, or striped with lively bands of red, like jasper. It varies in colour and texture from an opaque whitish chalk-like stone, to a red and white carnelian, giving fire with steel; the prevailing tints are delicate shades of brown and grey. The inner portions of the tree have been usually more perfectly fossilized than the exterior; which appears to have been, in many specimens, bruised as if by drifting, and deprived of its bark. The outer portions usually exhibit the most lively colours. Drusy crystals of quartz sometimes line their cavities. The carbonaceous matter of the wood has entirely disappeared, and nothing but silica and iron left.

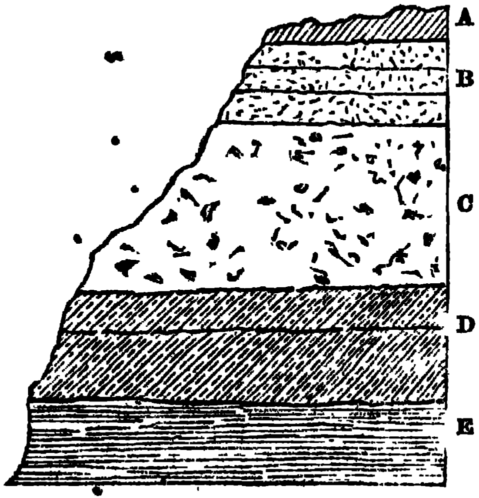
The fossil trunks and fragments of silicified wood occur partly imbedded in the rock, and partly scattered over the soil and detritus. Numbers have been broken and destroyed by the natives to sell to the stone polishers, who manufacture the most attractive fragments, under the name of petrified tamarind wood, into brooches, seals, beads, studs, bracelets, boxes, &c.

Although fragments of silicified wood are found scattered here and there over the whole extent of this lateritic grit, yet the space into which the largest fossil trunks at Trivicary are crowded does not occupy an area of two square miles. There are no signs of any bed, like the Portland dirt-bed, in which they formerly grew, and no carbonaceous matter; and I have little doubt the trunks were drifted to the situation where they are now found at the edge of a granitic shore, and covered with sand and pebbles: it is very clear that they did not grow on the spot where they are now found petrified, mutilated, and prostrate, as supposed by many travellers.

Lithologic character of the Rock.—The imbedding rock is for the most part composed of angular grains of quartz, often stained with iron, and loosely cemented together by dark red and whitish clays, passing into a conglomerate, and into a tubular and cellular rock, differing in no respect from some varieties of laterite. The latter is seen at intervals occupying an exactly equivalent position along the coast to the northward. It imbeds similar layers, and nests of lithomargic earth. The singular hollow spheroids and tubular bodies, already described, are common to it and to the beds to the north in the vicinity of Madras. They have been mistaken for petrified fruit and seeds, but possess no traces of organic structure; and, in many cases, have originated from the action of water on the porous structure of the rock. The imbedded pebbles are both rounded and angular, the former predominating,—and are for the most part of quartz and chert, with a few pebbles of trap and the hypogene rocks.

The beds near Trivicary are shattered by deep vertical fissures. Their surface presents strong traces of watery erosion in a number of channel-shaped, sinuous, and basin-like cavities, some in situations above the influence of present drainage. Many of them contain sand and water-worn pebbles, similar to those in the subjacent rocks. Among the gravel scattered on the surface I found a pebble of the subjacent limestone, and several of greenstone.

The following presents a section afforded by some cliffs near the south-west extremity of the Red Hills.



A Surface gravel, about 2 feet thick.
B Loose red grit, about 4 feet.
C Grit with fragments of weathered quartz and felspar, 8 feet.
D Red grit with rounded pebbles of greenstone and quartz, passing in its lower portions into a variegated red and yellow grit, 5 feet.
E Variegated red and yellow grit, 4 feet.

All the beds below the gravel are interstratified with thin layers of purplish and white lithomargic clays, resembling those in the laterite.

The silicified wood of the Egyptian desert closely resembles that of Pondicherry, as also the rock in which it is imbedded at the "Fossil forest," near Cairo, not only petrologically, but in *gisement.* Both occupy overlying situations covered with gravel, sand, and other detritus, and rest on a marine limestone in strata but little inclined from the horizontal. Both have suffered from aqueous denudation exposing the subjacent limestones. I could not discover the least trace of extinct volcanos, or of volcanic substances, in the vicinity of either.

I am not aware of any other places in Southern India where fossil wood is found except Mungapett[1], and a few other localities on the banks of the Godavery and Wurda, where silicified coniferous wood occurs in very small quantities, and at Hingan-ghaut, on the north bank of the river, where silicified branches of dicotyledonous trees, and a very perfect portion of a palm, were found in loose blocks of a black and red chert resting on the newer trap formation: I am rather inclined to refer this to the fresh-water chariferous limestone and chert formation, than to the laterite and Pondicherry beds.

MARINE SANDSTONE BEDS OF RAMNAD AND CAPE COMORIN.

On the eastern coast, near the southern extremity of the peninsula, are some beds of sandstone. The shells they imbed (as far as their fractured state would admit of their being recognised,) are of species existing in the adjacent sea; they are tertiary, and may be classed, for the present, with the laterite and Pondicherry sandstone. The rock is of a less ferruginous character than either, and consists of a marine sand, rather loosely aggregated.

It occurs in some cliffs on the coast of Ramnad and stretches across the straits to Ceylon, as a low interrupted ridge, partially covered at high-water mark, and known by the name of Adam s Bridge.

Some of the more solid portions of this ridge, or reef, still remain in an insulated position, considerably elevated above the water's edge; for instance, the two hills on the island of Ramisseram, and the island of Manar. The intervening portions, and the direction of the ridge, are marked by a chain of sand banks; based, there is reason to believe, on the same sandstone which is found below the water level in the Paumbam passage.

This singular barrier of rocks, through which Government has succeeded in blasting a narrow passage, and partially opening the navigation of the Manar Straits to steamers and other vessels of small draught, formed once the bed of the sea; and was subsequently elevated to its present position, probably at the same period with the laterite.

---

[1] Malcolmson, Madras Journal of Literature and Science, July 1836, p. 216.

The strata are perfectly horizontal, and rest on a bed of gravel in some places consolidated into a conglomerate[1]. Similar strata form the geological structure of the southern portion of Ramnad and Tinnivelly.

Near Cape Comorin similar beds of marine sandstone are said to occur. Dr. Davy[2] notices identical beds of sandstone on the opposite coast of Ceylon, which he describes as being composed of siliceous sand, and minute fragments of shells: he considers it recent, and the process of consolidation still going on. It has, he observes, formed in many places below high-water mark.

Captain Jenkins, of the Quarter-Master-General's department, informs me that the natives have a tradition, that the low country of Ramnad, as far as Madura, was once covered by the sea.

PART VII.

Older Alluvium; Changes in Level of the Land and Rock Basins.

The rarity of beds and scattered boulders of true drift in Southern India, may be considered to add to the evidence already accumulated in favour of the theory, that icebergs floating in the ocean have been mainly instrumental in the transport of the vast masses of rock and detritus, principally granitic, which cover tracts of land in the higher latitudes of Europe and North America; indicated chiefly by their prevalence in northern regions, and rarity in those bordering, and within the tropics, and their recurrence in high southern latitudes; for instance, in Chili and Patagonia, where they appear with precisely the same unstratified aspect, the same mixture of vast rolled and angular blocks transported to great distances, over chains of hills, rivers, &c., from their original *situs*.

It is well known that the usual course taken by icebergs from the confines of the polar circles of eternal congelation is towards the temperate latitudes. These icebergs, as we know from the writings of Scoresby[1] and other navigators, have been seen drifting from the arctic regions freighted with beds of rock and earth, the weight of which was conjectured to be from 50,000 to 100,000 tons. These icy vehicles, long before arriving at equatorial regions, melt and shower down their rocky burthen on the bed of the ocean, or, stranding on some coast, gradually dissolve and deposit the blocks and sand in one confused heap.

---

[1] Madras Almanac, 1841, p. 47; Account of Ramisseram, by Assist.-Surgeon J. Kellie.

[2] Trans. Geol. Soc., Vol. V., Part II., p. 326.

Brogniart, apparently on the authority of M. de Luc, has given his opinion, that the blocks of granite around Hydrabad are real boulders; but after a careful examination, I feel convinced that these masses are *in sitû*, and resting on a granite and its detritus perfectly identical with that of which they are composed. They owe their globular shape, their scattered and isolated position, to such a process of weathering and spontaneous concentric exfoliation as I have attempted to describe in a previous and separate paper, on the subject of the Granites of India and Egypt.

As the terms "drift," "boulder formation," and "diluvium," have been latterly almost exclusively applied to the detritus supposed to have been deposited by the thawing of glaciers or icebergs, I have thought it requisite, to avoid any mistake as to their origin, to apply the designation of alluvium, in its extended sense, to certain beds of gravel and sand that are occasionally found covered by the regur deposit, and which occur in such situations as not to be accountable for by the agency of existing transporting powers; simply prefixing the term "older" to distinguish it from the alluvium now forming from the disintegration of rocks washed down by the rains and springs, and transported by rivers and local inundations.

The beds of older alluvium have been little attended to by Indian geologists; and few have therefore been described. Future investigation, I have little doubt, will disclose to us many more deposits than those now about to be pointed out.

DIAMOND GRAVEL OF CUDDAPAH.

At Condapetta, in the Cuddapah diamond district, underlying a bed of regur in some places twenty feet thick, is found a gravel bed, which I found to cover an area of several miles, from two to six feet thick, resting upon the diamond limestone. I saw no pebbles, (with the exception of a few nodules of *kunker* which may have been recently formed in it,) of more recent origin than the diamond sandstone and limestone. It was principally composed of rounded fragments of trap, granite, and the hypogene schists, which must have been transported from the distance of twenty or forty miles, intermingled with pebbles of quartz, jasper, and chert, and others from the adjacent sandstone and limestone. In this gravel, intermixed with kunker and iron ore (the oxide), the diamond is found as a transported crystal or pebble, often fractured, and with slightly worn edges. The diamond gravel near Parteal[1] consists of a bed two feet thick, composed of pebbles of sandstone, hornstone, quartz, jasper, and flint, with fragments of occasional rocks, epidote, and abundant ferruginous sand, lying under a layer of tufaceous carbonate of lime (kunker) cementing similar gravel, but in which the diamond never occurs. Both deposits are covered to the depth of fifteen feet by the recent alluvium of Ellora, which overspreads the space between the deltas of the Kistna and the Godavery.

---

[1] Voyage, 1822, p. 233.

Wakoory Bone Deposit.—In the Nizam's territories[2], at Wakoory, about twenty-two miles south-east from the cantonment of Hingoli, is a bed of gravel, cemented by kunker, which appears to underlie the whole valley of the Baingunga; and there is reason to suppose that the same stratum underlies the alluvial black soil of the valleys in the vicinity of Hingoli. In 1837 the river at Wakoory rose to an unprecedented height; the stream left its own bed; and, in falling into the Baingunga river, about a mile from Wakoory, washed away much of the black soil from the right bank, thus exposing the substratum of gravel cemented by kunker. A considerable portion of the latter was also cut away, by the force of the water in its fall of about forty feet into the Baingunga.

During the process, the tusks and bones of a large animal were washed bare, at a depth of from forty to fifty feet, imbedded in the gravel. The village cow-herds, it is said, broke the bones, and otherwise destroyed the skeleton, before it was known at Hingoli that such discovery had taken place. Steps, however, were taken to prevent further destruction, and all that appeared were secured; viz., three pieces of the tusks (there were two tusks distinct, *in sitû,* in the gravel forty feet below the surface,) and one long fragment of bone; all the other large bones had disappeared. A mass about five feet long and two feet broad of jumbled bones and gravel, remained.

Part of the tusk, half fossilized by carbonate of lime, I took to England in 1841, and showed it to Professor Owen, who immediately pronounced it to be fossil ivory; probably a Mastodon's tusk.

---

[1] Captain Macpherson, Asiatic Researches, Vol. XVIII., pp. 118 and 119.

[2] Madras Journal of Literature and Science, for April, 1838, p. 477.

The large collections of fossil bones from the basin of the Jumna[1], were found under the kunker clays of the Dooab, 150 feet below the surface, but the sand and gravel of the Sewalik and Nerbudda bone beds were cemented, like the gravel bed of Wakoory, by calcareous infiltration.

During the boring experiment at Calcutta in 1837, a fossil bone, —the fractured lower half of a humerus of some small animal of the canine species,—was brought up by the auger from a depth of 350 feet below the surface of Calcutta, in a bed of quartzose and micaceous sand, about 250 feet below the extensive alluvial deposits of the yellow kunkery clay, which entirely cover, or rather form, the Gangetic Plain. The sand bed was underlain by a bed of black peat clay, imbedding black carbonized wood, between peat and lignite, and perfectly carbonized wood, resembling the Assam coal, in rolled lumps. The last were found at the depth of 392 feet. Two fragments of fossil Testudo, and a rolled fragment of vesicular basalt, were brought up from the great depth of 450 feet.

Western Coast Deposits.—Professor Orlebar informs me that underlying the regur, at Baroche, on the western coast, are beds of a yellowish-brown micaceous sand imbedding nodules of kunker, extending so far inland as Ahmednugger and Deera. They rest on trap, granite, and a sandstone resembling that of Badami. No organic exuviæ were found in these deposits.

Deposits in the Valleys of the Bima, Kistna, Tumbuddra, &c.—In the valleys of the Bima, the Kistna, and the Tumbuddra, and other large rivers, are occasionally seen beds of alluvial gravel elevated beyond the highest existing inundation lines. Some of these deposits may be ascribable to shifts from time to time in the course of the river's bed; a few to the action of rain in bringing down alluvium from the mountain sides; but the majority appears to have been accumulated under conditions not now in existence; probably, during the slow upheaval of the Western Ghauts and plateau of the Deccan, when the water occupied a much greater extent than at present. In many places the rivers have cut their way through these deposits; in others, channels exist of rivers, where now, as in the *Bahr bila maieh*, in Egypt, no water flows, or but a diminutive streamlet.

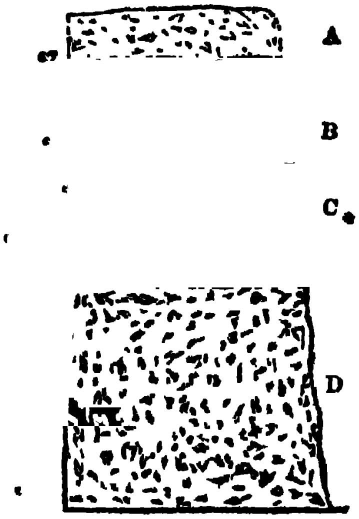
Captain Allardyce, a most intelligent and accurate observer, informs me that the Moyar valley, which runs along the table land of Mysore by the base of the Nilgherries, differs entirely from a common mountain glen. Though a mile or more in breadth at some points, yet, it is rather a ravine, or fosse, cut in the plain and not hemmed in by mountains. It opens out into the lower plain of the Carnatic, at the Gujulhutty Pass: the sides are precipitous, and its bed very much like the deserted channel of a river. The only stream now flowing in it is the Moyar; which, even in the monsoon, does not fill one hundredth part of its breadth and heighth: yet, this singular excavation, extending some thirty miles in length, is unquestionably a waterworn channel. It is no fissure; for its bed is quite solid and connected, and composed of strata of the hypogene rocks.

---

[1] Madras Journal of Literature and Science, for April, 1838, pp. 475 and 476.

Gravel on summit of Nilgherries.—On the summit of the Nilgherries, at an elevation of above 6000 feet from the sea's level, Captain Allardyce informs me that he observed traces of a diluvial current. He states that the gravel and loam there are arranged in such a manner as could only take place by deposit from water; the gravel being lowest, in a thin, distinct, and separate stratum, with the lighter loam covering it to the thickness of several feet. Benza mentions[1] having picked up at the base of these mountains, near Motipollium, a fragment of black mountain limestone, a rock which is not to be found *in situ* within hundreds of miles. The brooks, even on the summits of the Koondahs, are seen threading their way through beds of alluvium which they could not have deposited under existing conditions.

Nellore, Pondicherry, and Madras Marine Alluvium.—Pondicherry stands upon an alluvium resting on beds of dark blue, or grey marine clay, which extend inland nearly to the base of the Red Hills. The following is a section afforded by a recently sunk well in the town.



A Is a layer of a reddish brown sandy soil two feet thick.

B A bed five feet thick of a blackish clay mingled with a small quantity of grit, and containing existing marine shells.

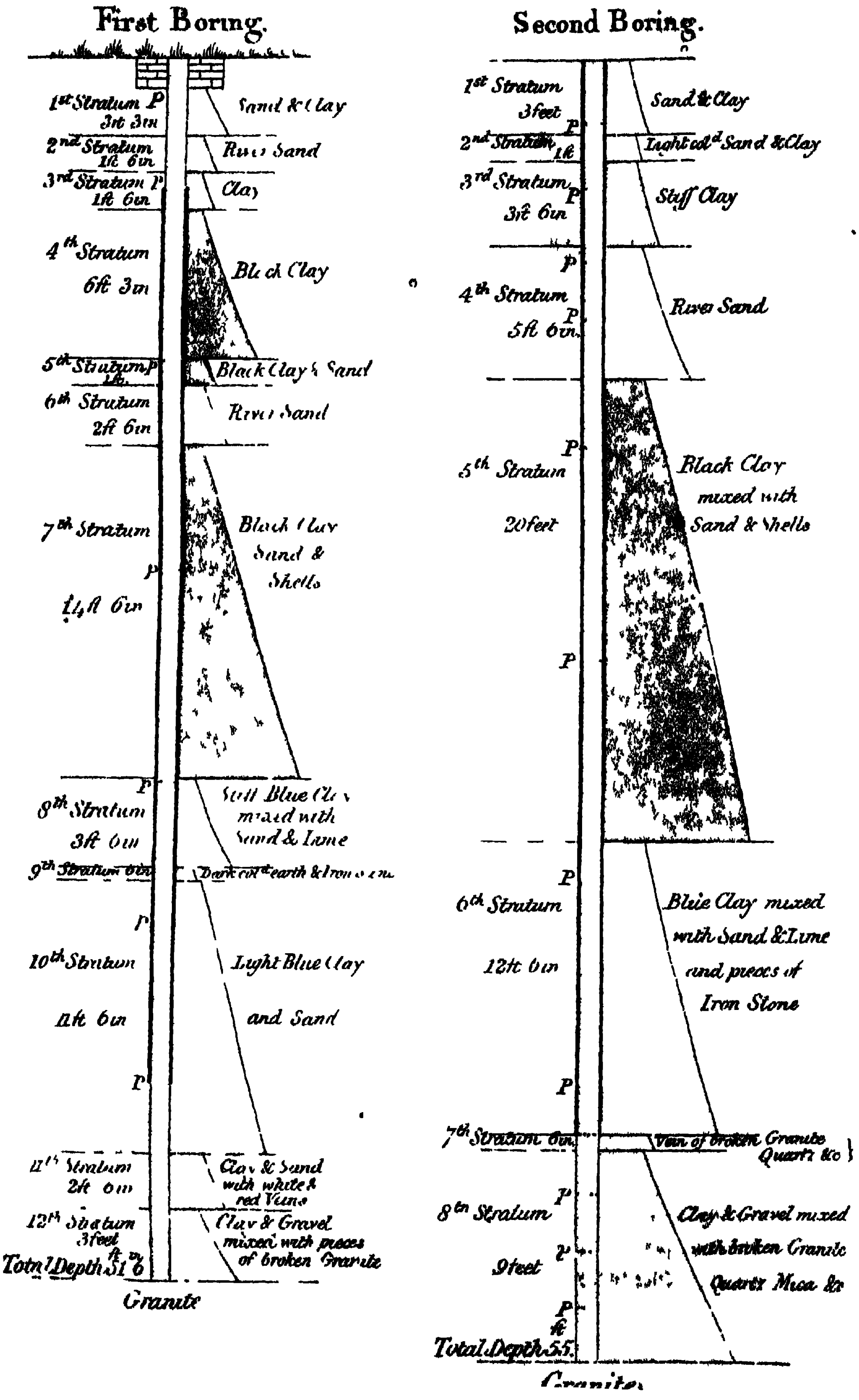
C Bed of black clay almost pure, also five feet thick.

D Beds of reddish quartzose sand, about ten feet thick.

---

[1] Madras Journal of Literature and Science, Vol. IV., p. 27.

Sections of Two Experimental Borings of the Earth at the Land Custom House, Madras. Executed by Order of Government in Oct^r & Nov^r 1832



First Boring.

Second Boring.

Near Cottapuram and Kistnapuram south of Nellore I found similar beds of marine clay underlying the alluvial sand. The water percolates through the loose texture of the arenaceous stratum and collects in hollows in this impervious clay bed below, forming the reservoirs down to which the generality of the wells are sunk. As might be expected, the water is, in general, slightly brackish.

I have observed in other localities on the Coromandel coast beds of this dark clay, at depths of from twelve to twenty feet below the present sands and alluvium, imbedding existing marine shells, and extending inland, sometimes two or three miles. On the alluvium covering them, stand Hindu villages, pagodas, and ruins of high antiquity. Over one of these marine beds the greater part of the European portion of the city of Madras is situated, separated by a bed of sand, clay, and soil, from five to fifteen feet thick. South of Madras, beyond the Adyar river, this dark-coloured clay abounds so much in large and thick beds of marine shells, that it is covered with excavations made by the chunam-getters of Madras, who use the shells to burn into that beautiful marble-like lime, so great an ornament to the churches and other buildings at Madras. These shells are preferred to those at present thrown on the sea beach, as freer from saline impregnation which makes the chunam liable to crack in drying.

The saline matter has evidently been carried off for the most part by the fresh-water springs or rivulets of the marshy grounds under which the deposit lies, and which was probably a small estuary or inland lake; the surface, even now, is so low as to be mostly under water during the monsoon. Small rolled fragments of carbonized wood between peat and lignite, occur in it.

The lithographed drawing exhibits two sections of the beds on which the city of Madras stands, down to the granite which is found in the deepest, No. 2, at the depth of fifty-five feet,—afforded by borings near the land Custom-house, about three-quarters of a mile inland from the sea. Intervening between the black clay and the granite, will be found first a bed of blue clay mingled with sand, lime, and pieces of "ironstone" (laterite?); and resting immediately on the granite, a bed of clay and gravel mixed with broken granite, quartz, &c. It does not seem at all improbable that the dark clay is identical with the regur. No organic remains, except marine shells, have hitherto been discovered in it.

These marine deposits were elevated evidently during the Post-Pliocene period, by forces which it would appear are not at rest; and, perhaps, like those affecting some tracts along the shores of the Baltic, cause an undulating movement, raising some parts, and depressing others, while some rest stationary.

Of the elevatory movement on the Coromandel coast there can be little doubt, from the decisive evidence of the raised inland marine beds; and it is stated that Masulipatam, once close to the sea, is now nearly a mile inland. The Puranas assert that the whole of this coast has been raised from the bed of the sea. With regard to the last fact, and to the sinking of the coast in certain places, it must be borne in mind that alterations in the configuration of a coast, caused by storms, unusually strong swells, and partial elevations of the sea's bed, will affect other portions of the same coast to which the current may be deflected.

We have now arrived at the traditional and historical period, and I shall proceed to state a few of the cases where what was formerly said to be land is now covered by the ocean.

Mahabalipur.—It is stated in Brahmanical writings that the ancient city of Mahabalipur, (now termed the Seven Pagodas,) about forty miles south of Madras, was anciently overwhelmed by the sea, which now rolls over the greater portion of the submerged ruins. It is supposed by some to have been the Palibothra of Ptolemy, a place of considerable commerce. I was informed by Lord Elphinstone and Mr. W. Elliot, that whenever a storm took place from the seaward, Roman, and occasionally Chinese coins were cast upon the beach. One of the former, according to Mr. Norton, is of the reign of Valentinianus. General Fraser informs me that south of these ruins, at Ariacoopang and Cuddalore, pieces of brick, tiles, and pottery are taken up from the bed of the sea at considerable distances from shore, beyond the recoil of the tidal wave. Still further south, near the embouchure of the Cauvery, the Brahmans point out the submerged site of another ancient city. At Madras, from all I can collect from the oldest inhabitants and survey, the sea has certainly encroached latterly on the ground it formerly occupied: while St. Thomé, an ancient Portuguese settlement, a little south of Madras, is traditionally said to have stood twelve leagues inland[1].

Adam's Bridge.—The celebrated ridge of rock called Adam's bridge, which the Brahmans (confirmed by the records of the Pagoda at Ramisseram) assert, formerly connected Ceylon with the peninsula of India, and believe to have been miraculously constructed by Rama, is now submerged at high water, having been broken through by a storm in the fifteenth century. The rock of which this ridge is composed, is of a loose sandstone, imbedding fragments, apparently of existing marine shells, and formed at no distant period part of the bed of the sea. It is connected with beds of a similar rock on the continent, and on Ceylon. The natives believe that the whole of the adjacent low country of Ramnad has risen from the ocean, to the extent of seventy miles inland.

---

[1] Sousa's Portuguese Asia, Tom. I., p. 270.

Malabar Coast.—Indications exist of the sea having covered certain parts of the Malabar coast to a considerable distance inland. The present town of Barcoor, north of Mangalore, supposed by Rennell and Robertson to have been the Barace of ancient geographers, and which now stands two or three miles from the sea, is said to have formerly stood on the shore, and its port to have been frequented by large ships from various regions[1]. Some of the cliffs running parallel with the present coast, at some distance inland, have every appearance of having been formerly washed by the sea; and the Brahmans assert, that the whole of the Malabar coast was raised from the ocean for their special use.

Frequent mention of earthquakes[2] may be found in the history of the Malabar coast, which extends from Cannanore to Cochin, about forty-two leagues. In 1784 a strong concussion was felt. "The most remarkable changes are to be found in the vicinity of Cochin. On its north side we find the island Vaypi, which was thrown up by the sea about the the year 1341. The soil upon this new formation resembles that of the flat districts of Malabar, which consists of sea-sand and calcareous matter combined with clay, said to be washed down from the Ghauts.

"The production of this island had so strong an effect on the minds of the Hindus, that they marked the geological phenomenon by commencing from it the new era, termed *Puduvepa* (new introduction). Contemporaneous with the appearance of the island of Vaypi, the waters, which during the rainy season are discharged from the Ghauts, broke through the banks of the river Cochin, and overwhelmed a village of the same name, with such impetuosity as to sweep it away, never observed it below the escarpment of the Western Ghauts on the coasts of Malabar, Canara, or Travancore.

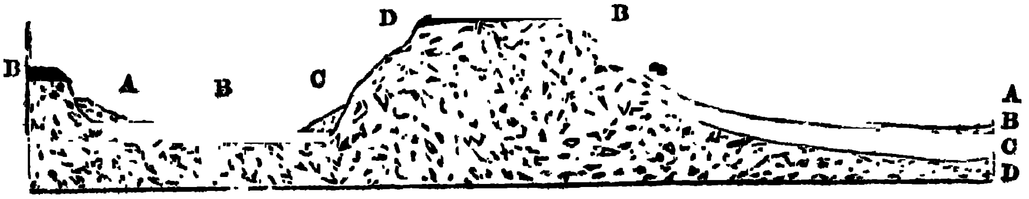
---

[1] We learn from Pliny and Arrian, that Barace was the principal emporium of Indian trade. It was frequented by the ships of the Alexandrine merchants, which sailed from the port of Berenice in the Red Sea, during the south-west monsoon, to Muziris or Mangalore; but in consequence of that place being infested by pirates, they preferred staying at Barace till the beginning of December or January, when they returned to the Red Sea.

[2] Bartolomeo, quoted by Dr. R. Thomson. Madras Journal of Literature and Science for January, 1837, pp. 176, 177.

Physical Aspect.—The plains occupied by the cotton soil are in general marked by their horizontal sea-like surface and almost treeless aspect. The vegetation which almost characterises it is the shrub *Jatrophus glandulifera*, and the *nuth* grass. It is often covered with bushes of the thorny acacias, cassia auriculata, asclepias gigantea, butea frondosa, &c.

Geognostic Position.—It covers the kunker and gravel beds just described, and is generally seen as a surface soil; but if we examine the edges of great sheets they will generally be found to dip for some distance under the recent alluvium, which conceals and replaces them as a surface soil. It not only covers extensive plains, but the tubular summits of hills overlooking those of the diamond sandstone and limestone, newer trap and laterite formations, far above the present drainage level of the country: it covers all rocks from the granite to the laterite and kunker; and often fills up depressions and chinks in their surface, as seen in the accompanying section. Soundings on a bluish-black clay are obtained in various situations off the Coromandel coast, which closely resembles the régur, as also the blue clay imbedding the marine shells below the cities of Madras and Pondicherry. Part of this deposit, it is not improbable to suppose, may have been derived from the denudation of the régur that once covered the maritime tracts of the Coromandel coast.



A A A Recent detritus and alluvial soil.
B B B B Regur.
C Kunker.
D D D Laterite.

Composition, &c.—The purest regur is usually of a deep bluish-black colour, or greenish; or dark greyish black, fracture varying from shining to earthy, streak brownish, or greenish black, shining; when placed in water it crumbles slowly with emission of air bubbles, and forms a tenacious paste; when moistened it gives out an argillaceous odour. Before the blowpipe, *per se*, it melts into a greenish glass, or dark slag. Mr. Reid fused some of it in a large covered crucible placed in a furnace into a solid mass, on the surface of which a crust of oxide of iron formed. A chemical analysis made by my friend Dr. Macleod afforded the following result.

Silex	48	2
Alumina	20	3
Carbonate of lime	16	0
Carbonate of magnesia	10	2
Oxide of iron	1	0
Water and extractive	4	3
	100	0

The quantity of iron it appears by this analysis is not sufficient to account for the black colour of this soil, which may be partly attributed, as in the case of the Cuddapah limestone, to the extractive or vegetable matter it contains. The regur of Trichinopoly, I am informed by Captain Allardyce, does not fuse, and contains imbedded crystals of pure mineral carbon, which are converted before the blowpipe into a white ash. There is, no doubt, nearly as great a diversity of composition in the regur deposit, as we find in other equally extensive aqueous rocks.

The best kinds of this extraordinary soil are rarely suffered to lie fallow, except by accident, and never receive manure, which is even supposed to lessen its fertility. It has yielded annually, crop after crop for upwards of 2000 years (usually in triennial rotation) of cotton, juari, and wheat, or bajri, without receiving any aid from the hand of man, except an annual scratching with a small plough, and a decennial, or still more seldom, clearing of the nuth grass by means of the large plough. It is irrigated solely by the dews and rains of heaven.

The chemical composition of the cotton plant it produces, somewhat assimilates in its ingredients that of the soil, as Dr. Macleod's analysis, subjoined, shows. In addition will be found the alkali of the vegetable, and the muriate of soda, which, as well as the carbonate, are frequent accidental ingredients in the composition of the regur. They sterilize it when present in large quantities. The proportion of silex in the cotton plant, as might naturally be expected, is much less, and the alumina is altogether wanting.

Silex	7	0
Alumina	0	0
Carbonate of lime	45	6
Carbonate of magnesia	25	0
Charcoal, oxide of iron, and loss	5	2
Carbonate of potass	10	6
Muriate of potass and soda	6	6
	100	0

The regur is remarkably retentive of moisture; a property to which is ascribable much of its fertility, since it has been ascertained by the experiments of Sir Humphry Davy that the absorbent power of many soils with respect to atmospheric moisture are greatest in the most fertile soils. He dried[1] 1000 parts of a celebrated soil from Ormiston in East Lothian, by a heat amounting to 212° Fahrenheit, and found that by one hour's exposure to air saturated with moisture at a temperature of 62° it gained 18 grains. Dr. Christie thoroughly dried a portion of régur by a heat nearly sufficient to char paper. He then exposed to the atmosphere of a moderately damp apartment 2615·6 grains of it, and found after a few days it had gained 147·1 grains. He now exposed it to an atmosphere saturated with moisture, and found that the weight increased daily till the end of a few weeks, when it was found to be 2828·4 grains. The soil had therefore gained 212·8 grains, or about 8 per cent.

During the dry season, when the crops are off the ground, the surface of regur, instead of presenting a sea of waving verdure, exhibits the black drear aspect that the valley of the Nile puts on under similar circumstances, and which powerfully reminded me of the régur tracts of India. Contracting by the powerful heat of the sun, it is divided, like the surface of dried starch, by countless and deep fissures, into figures usually affecting the pentagon, hexagon, and rhomboid. While the surface for a few inches in depth is dried to an impalpable powder raised in clouds by the wind, and darkening the air, the lower portions of the deposit, at the depth of eight or ten feet, still retain their character of a hard black clay, approaching a rock, usually moist and cold; when the surface dust, as I have proved, has a temperature of 130°. In wet weather the surface is converted into a deep tenacious mud.

Over the vast and fertile table lands where this soil prevails, rice, the staple article of food on the maritime and low tracts, is no longer, or but seldom, used by the lower classes, and cakes of wheaten flour, or of that of the juari and bajri are substituted.

The purest beds of regur contain few rolled pebbles of any kind; the nodules of kunker we see imbedded have probably been formed by concretion from the infiltration of water charged with lime; and it is only near the surface that the regur becomes intermingled with the recent alluvium of the surrounding country, or in its lower portions where it becomes intermingled with the debris of whatever rock it happens to rest on,—trap and calcedonies in trappean districts; granite, sandstone, pisiform iron ore, and limestone, in the plutonic and diamond sandstone areas. It sometimes exhibits marks of stratification: in Gujarat, Professor Orlebar informs me, the regur is distinctly stratified; and a writer on the Geology of the Hydrabad country, in the Madras Literary Transactions, (Part I, p. 82) observes, that the cotton soil there varies in depth from a few feet to many fathoms; and that it is generally found distinctly arranged in strata, which are sometimes separated by thin layers of sand or gravel. These strata, he observes, vary in thickness; they are sometimes horizontal; in other instances waved, or more or less inclined to the horizon.

---

[1] Madras Journal of Literature and Science, for October, 1836, p. 472.

Organic Remains.—No organic remains have hitherto been discovered in the regur, except a few fluviatile exuviæ on the banks of rivers, and land shells, all of existing species.

Origin.—Drs. Voysey and Christie, chiefly from the circumstance of the regur fusing into a dark glass and slag resembling the trap, and its dark colour, and its embedding minerals from the trap formation, are of opinion that it arose from the weathering of trap rocks.

In a paper read before the Bengal Society, in March, 1838, I stated my reasons for venturing to question the accuracy of this theory. They are briefly these,—that the trap rocks of India never weather into a black soil, but are seen every where to disentegrate into a red, brown, light or rust-coloured earth and detritus, as the protoxide of iron they contain, by exposure to the air, becomes converted into the peroxide, like a piece of iron which first blackens, and then rusts, on exposure.

The depth, extent, and situation of the sheets of regur, often far above the beds of existing rivers, and out of the reach of their greatest inundations capping both the tabular summits of hills, and the plains at their base, preclude the supposition of its being a fluviatile deposit as thought by Voysey. Besides, I found that the deposit of the large rivers running through the great regur tracts of the Deccan, viz., those of the Bima, the Kistna, and the Tumbuddra, differed widely from the regur, consisting principally of a reddish-brown silt, mud and sand, containing calcareous matter, partly deposited in it by calcareous springs, and partly the detritus of the beds of limestone and kunker, over which the course of the river occasionally passes. This silt and sand deposit sometimes acquires a dark hue from the admixture of the regur itself, which often forms the banks of these rivers, and which during the freshes are frequently undermined, and washed into the stream.

It is evident from the regur's resting indiscriminately on plutonic, hypogene, trappean, and aqueous rocks of widely dissimilar chemical composition, with some of which it exactly agrees, that it cannot be the result of the weathering of these different rocks, *in situ*, nor can its present elevated situation on these rocks be accounted for by fluviatile, or other transporting powers now in action. Its lying under all present alluvia is indicative of its greater relative age.

Its mineral composition, colour, the horizontality of its surface, cracked by countless fissures, assimilates more the black vegetable deposit we often see in the tanks of India, or the dark flat mud deposits of the Nile, which, like the cotton soil, I found to melt before the blowpipe into a greenish glass or enamel, to fall to pieces in water with emission of air bubbles, forming a tenacious clay, and to contain a considerable quantity of calcareous matter.

The components of the Nile deposit are the same precisely as those of the regur, as will be seen by the subjoined analysis by Regnault, but the proportions are different. That of the lime is nearly the same same in both. The mud of the Nile would appear to contain much more aluminous and less siliceous matter than the regur, but the proportions I found in both deposits to differ in different localities.

Mud of the Nile.

Silex	4	0
Alumina	48	0
Carbonate of Lime	18	0
Carbonate of Magnesia	4	0
Oxide of Iron	6	0
Water	11	0
Carbon (or extractive)	9	0
	100	0

The mud of the Nile is supposed to obtain most of its vegetable or carbonaceous matter from the overflowing of the great marshy lakes that lie stagnant on the table lands of Abyssinia during great part of the year. I have never been able to discover organic remains in it, nor have I heard of such being found, save pebbles from the subjacent shell limestone, and a few existing fluviatile and terrestrial exuviæ.

That the regur of India is an aqueous deposit from waters that covered its surface to a vast extent, I have little doubt: but it would be as difficult to point out at the present day the sources whence it derived the vegetable matter, to which in great measure it owes its carbonaceous colour, and the rocks, from the ruins of which its remaining components were washed, as to indicate the locality of the continent from the vast debris of which the Wealden beds were formed, and by the drainage of which a great river was supplied.

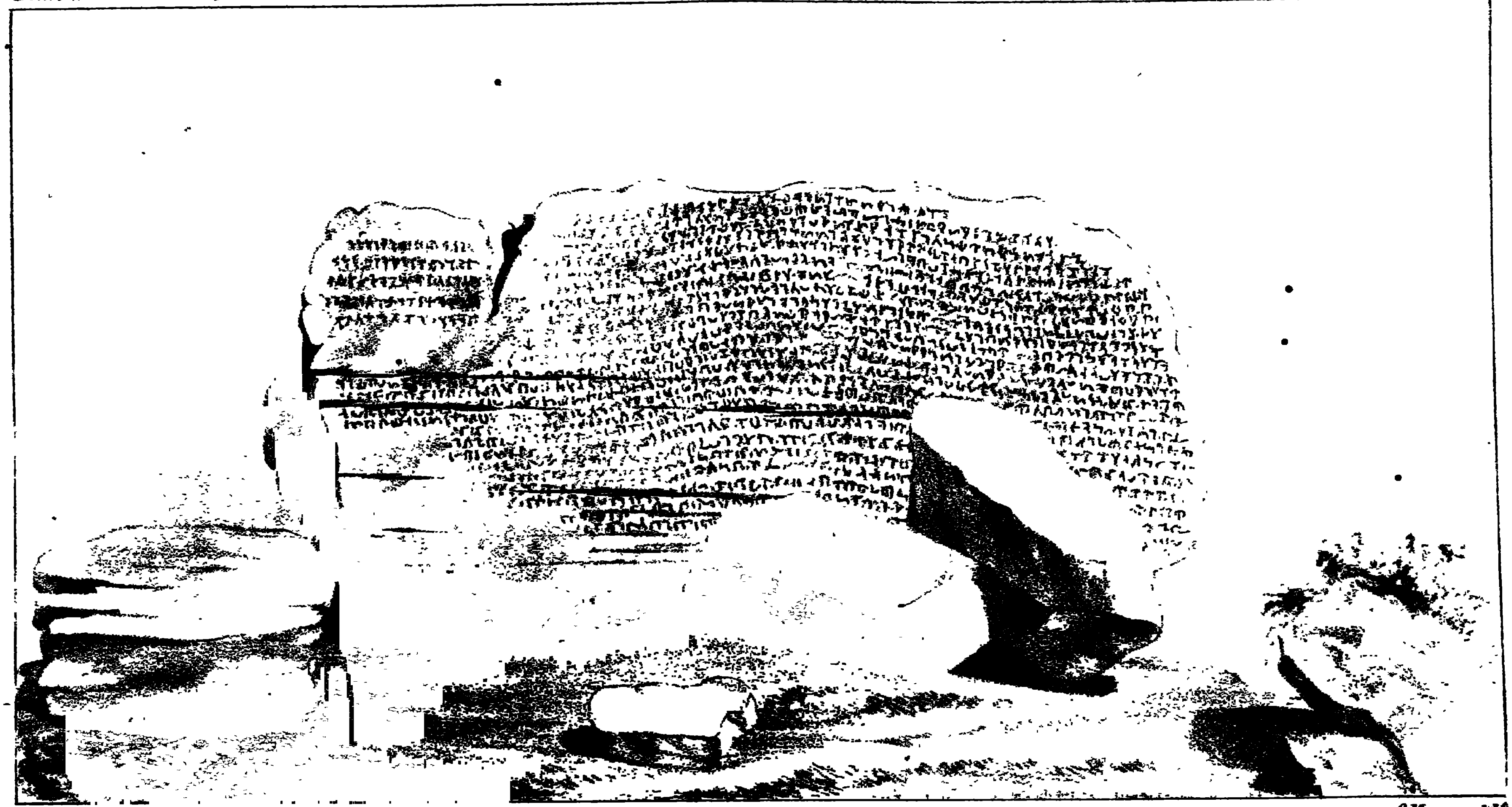
Shortly previous to my leaving England in 1842, I was present at a Meeting of the Geological Society, at which a specimen of the black soil, the *Chernoi zem*, that covers many of the steppes of Russia, and brought thence by Mr. Murchison, was exhibited, when both Mr. Lonsdale and myself were struck with the external resemblance this deposit bears to the regur. Its geological position and distribution also appear to be similar.

KUNKER FORMATION.

It is probable that the calcareous deposit termed *Kunker*, a Hindustani word (کنکر), but of Sanskrit extraction, signifying a nodule of limestone, or a pebble of any other rock, had an earlier origin than the laterite and some of the marine alluvial beds just described: but since it has not, as yet, been found underlying them as a separate and distinct bed, without penetrating into their substance, it will be best for the present to assign it a place between them and the regur—that is, its earliest deposits; since the process by which it was originally formed, although now less active, perhaps, than in former epochs, has not altogether ceased. There will be always some difficulty in distinguishing between the kunkers of different eras, the recent deposit differing little from the ancient in chemical composition, but being generally of a whiter colour, softer, and of a more cancellar structure.

Geographical Position and Extent.—The kunker formation is irregularly distributed in overlying patches over perhaps one-eighth of our area. I know of no tract entirely free from it, with the exception, it is said, of the summits of the Nilgherries. I have seen it, however, at the height of 4000 feet above the sea among the ranges on the elevated table lands. It is most abundant in districts penetrated and shattered by basaltic dykes, and where metallic development is greatest: for instance, in the copper district of Nellore, and the chrome and iron tracts of Salem. It is, perhaps, least seen in localities where laterite caps hypogene or plutonic rocks.

Geognostic Position.—It occurs filling, or partially filling, fissures and chinks in the subjacent rocks, in nodular masses and friable concretions in the clays and gravels above the rocks, and in irregular overlying beds, varying from a few inches to forty feet in thickness. It has been found at the depth of 102 feet below the surface of the surrounding country, prevails alike in granite, the hypogene schists, the diamond sandstone and limestone, and in the laterite: hence, the springs which deposit it must bring up their supply of calcareous



C. Masson del.

FRONT VIEW OF INSCRIBED STONE

latter ones; in all probability these deviations were due to the greater irregularity of surface. On the opposite side too, the upper lines of the smaller inscription there, were liable to the same observation. The lines moreover were not continuously straight, being carried out in an undulating course, as if the engraving had been influenced by the inflections of surface, which has produced a confused appearance, and was embarrassing when I wished to trace many of the lines throughout their full extent. Two or three horizontal fissures also occurred, which alike disturbed the clear course of the lines, one of which nearly traversed the whole breadth of the rock. M. Court's inscription was in a corner of the superior face, and separated from the great inscription by a perpendicular fissure: it was obvious, both from position and the style of the characters that this inscription was a distinct one. Here then were no less than three inscriptions in genuine Bactro-Pali characters. It may be conceived, I possessed sufficient inducement to encourage my companions to exertion, and that I willingly lent a hand to effect the removal of the moss. This was not so difficult a matter, we discovered, as to cleanse the rock from the green and slimy stains occasioned by the damp of ages. Nearly the whole day was expended in these labours, and after we had fairly succeeded, we passed over the surface a covering of prepared ink, as the preliminary to taking an impression on calico in the morning. This done we made our way to the village.

19th October.—Betimes we repaired to the rock, and having renewed the application of ink to the surface, we commenced the task of taking an impression. For this object, I had brought a large quantity of paper, of the stoutest fabric of Pesháwer, and twenty-five yards of fine British calico, which I had hoped from the representations of my young man would have sufficed for two impressions. We soon found that the paper would not answer the purpose, and it was plain that we had calico enough only for one impression; this however was effected, and constituted the labour of the day. The toil was great, as it was necessary to employ the palm of the hand, and forcibly too, to enable the gently moistened calico to accommodate itself to the irregular surface of the rock, and to produce the outlines of the characters. Of our success we could judge by the external appearance of the impressed calico, which on a black ground showed the characters precisely as they stood upon the rock, but as so many blank spaces. I was not altogether satisfied with the result, though as a first attempt, and the first impression that had ever been taken, it was still a tolerable effort. Having disposed of the superior inscription, we found that difficulties more serious than we could surmount, prevented us from repeating the process on the inscription at the opposite side. The lower part of the rock, on which it is engraved, slopes inwardly, while the soil on which it rests inclines outwardly, thereby forming an angle too acute to permit the free use of the arms. After fruitless endeavours to effect our purpose here also, I found that I must be contented to carry off a copy only.

As I purposed to devote the morrow to taking copies of the inscriptions by sight, we this evening exercised the ingenuity of the village smith in preparing half a dozen sharply pointed instruments, that we might the better trace and cleanse the channels of the letters. He converted for our use as many files, which he chanced to possess; and before we went to sleep, gave them to us prepared and tempered.

20th October.—At sunrise we were again at the stone, and with our new implements employed in clearing the letters of the inscription. After completing this part of our labours, we traced the letters on the rock with sharp angular pieces of a somewhat soft stone which we found in abundance around us. As the marks left by these stones were white, while the surface of the rock originally dark, had necessarily been considerably deepened in colour by the coverings of ink we had passed over it, the effect when the operation was terminated, was to ourselves surprising, and to our friends the villagers, little short of magical. They loudly expressed their feelings, affirming that they never had a notion that the entire stone was covered with writing, their knowledge having been confined to the obvious inscription of M. Court. They fully agreed with me that the Khán was a wonderful Khán, and that Sháh-Báz Kalendar was a cunning fellow, first to cover the stone with writing, and then to conceal the writing under moss.

In taking copies of the inscriptions, which was not done without difficulty from the waving and confused course of the lines, the young lad from Paráng proved serviceable to me, by guiding the end of a slender and long stick over the letters as I copied them, and by shifting it as I directed him. Towards evening, I had completed my copies of the three inscriptions, but after the pains that had been taken in clearing and bringing out the characters, I could not but regret being unprovided with fine calico, that I might take another impression of the superior inscription, under the advantages which would not fail to attend it. With little probability of success, but anxious that no attempt should be untried, I directed my young man to send for horses from the village, and to ride over with the Malek's son to Kote, and ascertain whether by chance, any calico could be procured among the

Hindú traders of the bazaar. During the day, I had essayed how far the coarse cotton fabric of the country would serve to bear an impression, but it had not answered. My young man returned from Kote, and to my great satisfaction presented me with twenty-seven yards of excellent British calico; a wonderful piece of good fortune; how so costly an article had found its way into the bazaar of a Yúsufzai village, I could scarcely account for; but its possession made me happy, and with light hearts we returned to supper and to rest at the village.

21st October.—By sunrise this morning we were anew occupied by taking a fresh impression of the large inscription. At noon, we heard the reports of cannons and small arms, which continued more or less sustained until afternoon, from which we inferred that Sirdár Saiad Mahomed Khán and his opponents had met in mortal conflict. We did not on their account remit our labours, but completed our impression in a manner, if not perfect, at least more satisfactory than the former one.

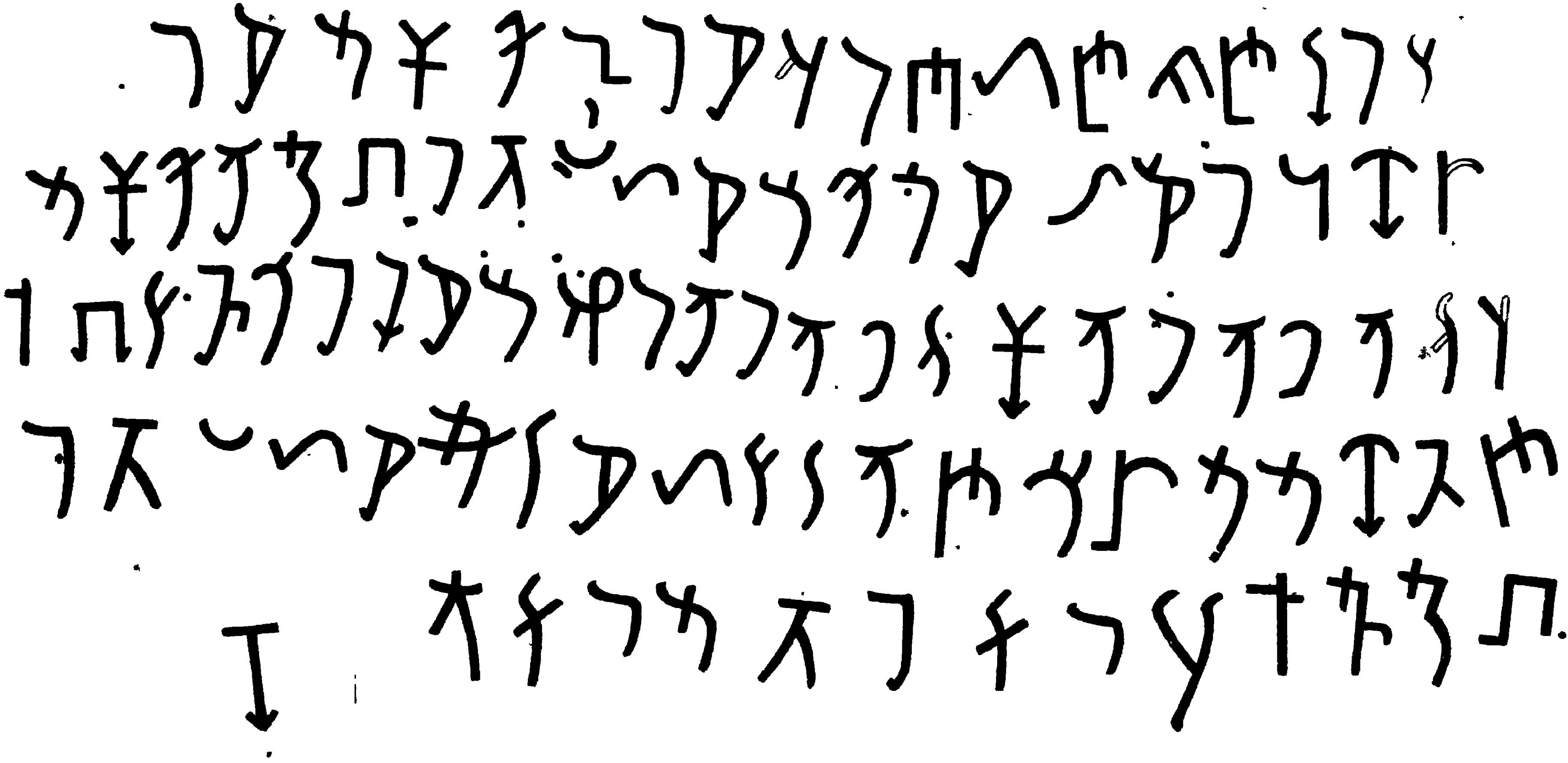
22nd October.—This day was spent at the stone, in completing our observations on it, and in the evening we retired to the village, with the intention of starting for Peshámer in the morning.

23rd October.—Two or three hours before daylight our horses were saddled, and we were ready to start. Malek Derú and the man he had commissioned to accompany us to Peshámer were also ready. I was unable, although he was suffering from ague, to dissuade the Malek from attending us on the road, and urged to no purpose that it was ague day; I was also unable to send him back after he had proceeded a reasonable distance; he would and did keep us company until we reached the Kála-páni rivulet, being determined, he said, not only to see us safe in his own limits, but beyond them; we parted after a good deal of embracing, and I hoped the good old man would be able to reach his village before the ague fit came on. He must have been above seventy years of age; but he was hale, and on horseback active. Riding this morning on a mare, followed, as is the practice, by the foal, he dashed among the high jungle grass with great spirit and satisfaction, and was much pleased when I familiarly addressed him as Bai Derú, and alluded to the exploits of his youthful days.

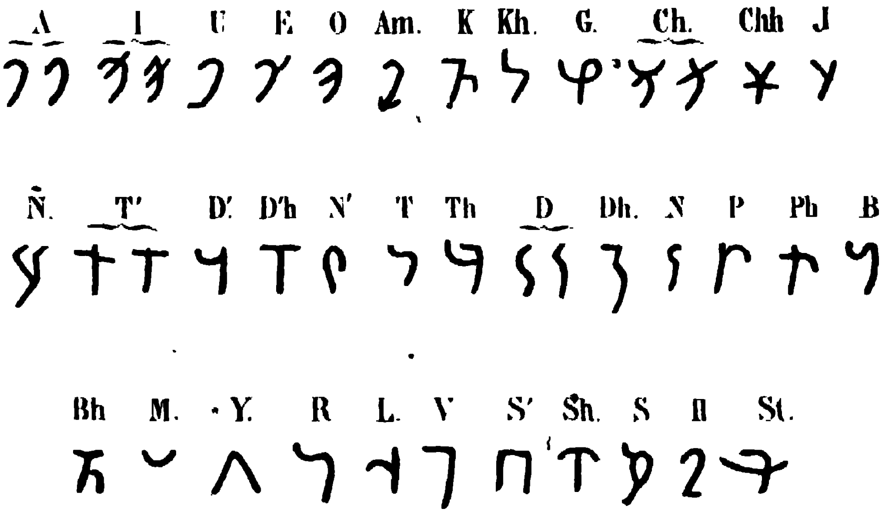
We crossed the Kála-páni at daylight, and without halting at Hotti, committed ourselves to the plain before us. On nearing the mound before noted as between Hotti and Do Sir, we descried in the distance, but approaching us, a number of spears rising above the grass. They might be in hostile or in friendly hands, but we had only to encounter what happened as well as we could; we therefore marched firmly on, taking care to keep well together. The spearmen gradually advanced, and as they came closer we observed a multifarious assemblage of men and animals; on our meeting them, we found many engaged in extinguishing the matches of their fire-arms, which by way of precaution they had lighted when they first beheld our party; they were a káfila from Sohát, bringing grain laden on bullocks. We kept on our journey, and without farther rencontre reached Paráng. The Malek's man was unable to keep farther pace with our horses; and we left him to pass the night there, and to make his way leisurely to Peshâwer the next day. For ourselves, we resolved to proceed at once to Peshâwer; therefore dropping a present into the hand of the young lad who had accompanied us to Sháh-Báz Ghari, we crossed the river, and, by the road we had come, made for the city, which we reached a little before sunset; and took up quarters at the Bágh-i-Vazír (the Vazír's garden), from which we had started on our trip.

The following day Malek Derú's man joined us, and after allowing him due rest, we made over to him a Korán, a lunghi, a postinchi, and two pairs of shoes, the articles desired by the Malek, and due to his civility; in addition we made over a few sundries which we judged would be acceptable; due to our own friendly feelings, and to show to him and to his people that attention and courtesy were appreciated, as well as to secure a welcome reception for myself, in case I should again wander that way, and that the traveller who may hereafter visit Sháh-Báz Ghari should have no reason to complain that I had preceded him. These duties acquitted, a lunghi was bound around the messenger's head and we dismissed him to rejoin his master.

THE SEPARATE TABLET



THE ALPHABET.



The vowel a *is inherent in the consonants; the other vowels,* anuswara, *and* r, *are made by little strokes* I *is drawn downwards crossing some line of the consonant as* ki, ti, śi, sti: U *turns towards the left below as* su, ku, hu: E *is made by a stroke above, as* se, śe ñe: O *passes downwards, but does not cross any line as* bho, yo, so: Anuswara *is made by two strokes at foot, as* kan, śan: R *is a stroke towards the right as* tra, śra *Sometimes two such marks are found together: as* pri, pur, kram.

Vol 8, p 303.

ART. XV.—*On the Kapur-di-Giri Rock Inscription.* By Mr. E. NORRIS.

[*Read March* 1, 1845.]

FOR above a month past, I had been trying at intervals, but without success, to decypher the Kapur-di-Giri Rock Inscriptions, which were brought to Europe by Mr. Masson; all of which had been copied by sight, and of which some also were fac-similes impressed on calico, in the manner which Mr. Masson has described. About ten days ago, on examining the copy of that portion which forms the back or south side of the rock, I remarked a group of letters of frequent occurrence, representing, according to the value attached to such of the characters as correspond with those on the coins of Bactria, the word *piyasa*; I found that the group was repeated frequently, and that in every case it was preceded by three letters which I could not identify. I had not the resource of a cloth impression, as Mr. Masson had found it impracticable to apply the calico to that part of the rock; but on comparing all the different examples together, I judged that the same group was always intended: in some cases the first letter took the form of *di*, as read on the coins; the second I read *r*; and the third *n*; this would make the word *Diranapiyasa.* I supposed this might be a name in the genitive case; and the supposition was corroborated by finding the same word, but without the final *s*, at the head of the separate tablet, which formed apparently the title of the inscription, and of which I had made a pretty fair transcript, by collating three calico impressions with the copy made by Mr. Masson on paper. A further investigation, and an examination of the list of names in Turnour's *Mahawanso*, convinced me that the word was *Devanampiya.* I immediately communicated this discovery to Mr. Dowson, to whom I had before given a corrected copy of the first separate tablet; and that gentleman, who unites a knowledge of Sanskrit to an acquaintance with the discoveries of Prinsep in Indian antiquities, proceeded to compare this tablet with the Girnar proclamation of *Devanampiya Piyadasi.* On doing this, he soon found that the inscription on the tablet coincided nearly with the seventh division of the Girnar monument. He lost no time in informing me of this coincidence; we proceeded to a closer examination, and found no greater difference between the two than might be expected between two different versions of the same original document.

I confess, that instead of feeling pleasure at having made this discovery, I was at first a little disappointed at finding that we had probably nothing more than a third edition of the Girnar monument, of which a second had been found at Dhauli, in Cuttack, and published with that of Girnar by Mr. Prinsep. But I remembered that the two versions already known had been found to differ in some particulars, and that the one now discovered might contain some new matter. I remembered also, that the complete acquaintance with the forms of the alphabet which so extensive a document must afford, would enable us to read with certainty the legends on the Bactrian coins, many of which still remain doubtful; and that with the alphabet, we should in all probability recover the language of the legends. I therefore proceeded to examine the remaining inscriptions, and I was not disappointed in the result. I began upon the portion which forms the front of the rock given in Mr. Masson's drawing, and proceeded, letter by letter, through the whole of it, collating every word with the Girnar inscription. I found the two documents to be similar, but not exactly alike; half the words are absolutely identical; but a considerable proportion of the remainder are effaced, or too indistinct to be recognised, though I have no doubt that I shall recover some by examining the impressed cloth more closely.[1] This portion contains all the Girnar tablets from the first to the eleventh, with the exception of the seventh, which was cut on the separate tablet before adverted to, and was the one of which a very imperfect copy was furnished to Mr. Prinsep. The second tablet is shorter than that of Girnar; the sixth has much additional matter; and the ninth differs considerably.

I then proceeded to the sheet containing the inscription on the back of the rock, which led me to the discovery, and I found that it contained, in substance, the three remaining divisions of the Girnar inscription, but at greater length. Here I was chiefly desirous of verifying the portion of the thirteenth tablet, which mentions the names of three western kings. In this I was deprived of the resource of a cloth impression, which had helped me to the clearing up of many words in the other portions; but very luckily the line which I wanted was, with one exception, perfectly legible: it confirmed Mr. Prinsep's conjecture as to the names of *Antiochus* and *Antigonus*, added a fourth name to those of the three kings, and dispelled all doubts as to the meaning of the word *Chaptaro*, which he thought signified Egypt. Mr. Prinsep read the lines thus: "And the Greek king besides, by whom the Kings of Egypt, Ptolemaios, and Gongakenos,

---

[1] I have since received Mr. Masson's first attempts at taking impressions of the rock, and expect to derive much assistance from them; several portions illegible in the second impression, are very clear on the detached pieces, though these are on the whole the most defective.

(or Antigonus), and Magas, &c.," and conjectured that the Greek King was *Antiochus.* The Kapur-di-Giri inscription reads:—"The Greek King Antiochus also, and the *four* Kings, Ptolemy, Antigonus, Magas, and Alexander."[1] I have not yet had an opportunity of looking into the historical statements of those dark and troubled times; and cannot now guess at the monarch called Alexander, unless it be Alexander, the son of Pyrrhus, king of Epirus, who would I fear be too early; in all probability, the connexion between the East and Europe was not sufficiently frequent to maintain in India any very accurate acquaintance with the changes that were then so rapidly taking place in the West.

The Society has for some years been in possession of an accurate fac-simile of the Girnar inscription, which was probably taken after the lamented Mr. Prinsep wrote his account. I have examined the passage in question in this fac-simile, and I find there that the stone is broken off in the very part which probably did contain the name of Alexander; and that the name of Antigonus is quite distinct upon it, and could not be read *Gongakena,* as it was on the copy read by Mr. Prinsep; though he very ingeniously conjectured the true reading.

The alphabet in which the Kapur-di-Giri inscription is written, is in one respect more complete than that of the Girnar Rock. It contains three very distinct sibilants, and will thus often furnish a clue to the true reading of a word, which is wanting in the others. I think I find the cerebral letters also; but am not quite sure.[2] It is, however, unfortunately, less distinct, several letters being so like each other as to be easily confounded; resembling in this the old Cufic character, in which, according to Marcel, many words of three letters only, may be read above forty different ways, each having a real sense. It appears, also, to be sometimes deficient in vowels, though this arises without doubt from careless engraving, and perhaps still more frequently from the imperfect state of the impression; when fully legible, each vowel is expressed by a little oblique line in various positions; but no distinction is made between long and short vowels. The engraving on the rock is carelessly executed throughout; and in the very beginning, the name of the king is written *Priyasi,* instead of *Priyadarsi.* The language is like that of the Girnar inscription, but perhaps nearer to Sanskrit than that. The name

---

[1] The name of Alexander is not quite positive; it looks as if preceded by a consonant,—perhaps *h,* making Halexander. Ptolemy, if correctly copied, is written Turamaro, and not Turamayo, as in the Girnar tablet; but the second *r* is uncertain.

[2] I have since distinctly found four of them.

Piyadasi is generally made Priyadarsi, always where fully legible; dhamma is written dharma; and the same forms occur in other cases. It will be understood that I have had no time for any critical remarks, even if my acquaintance with Sanskrit were sufficient to enable me to make any. My task will be to furnish an alphabet, and so far as I can, a legible text, which will be better read by others.

The portion given in the plate is the seventh edict, which forms a separate tablet on the rock, and is all that could be got ready for printing in the present Number. It is reduced on a scale of one inch to four, from a copy compiled by collating three impressions on cloth and three on paper, made by Mr. Masson. All these impressions are incomplete; but each contains some portion wanting in the others, and a letter or two has been obtained from the imperfect copy furnished to Mr. James Prinsep, which has been obligingly communicated to me by H. T. Prinsep, Esq. With all these aids, this part may be considered almost a fac-simile. I give what appears to me the reading in Roman characters, parallel with the readings of the corresponding portions of the Girnar and Dhauli inscriptions: the first from the copy taken by Mr. Westergaard, and published in the number of the Bombay Branch Society's Journal for April, 1843, collated with the fac-simile in this Society's possession, and the second as read in the fac-simile published by Mr. Prinsep; the letters in Italic are doubtful.

Girnar. — Devánampiyo Piyadasi ráj*á* savata ichhati save
Dhauli. — Devánampiye Piye*da*nsí lája sachata ichhati ***
Kapur-di-Giri. } Devanampṛiyo Priya[dar]śi rajo savatra ichhati sava

G.—pásand́a vaseyu save te sayamancha bhávasudhincha
D.—hánand́a vase * ti save *paga* sachhaman bhávuudhícha
K.—pashand́a vaseyu savo ite sayama*n* bhavaśudhicha

G. — ichhati janotu uchávacha chhando uchávacha rago te
D.—ichhanti munisá *u*chavala *chha*ndá uchávúcha lágá te
K.—ichhanti janocha uchavacha chhando uchavacha rago te

G. — savam vakásanti ekadesam cha kasanti vipú[su]le tu pi
D.—sanvam vá ekadasa * * chati vidalá pi ná
K.— savam va ekadeśam *va*pi kashanti vipule pi cha

G.—	*dá*ne	yasa	násti	sayam*e*	bhávasudhi	tiva	katam	ñatá
D.—	dáne	[illegible]asa	na*th*i	dhayame	mávasudhicha			
K.—	dane	yasa	nasti	sayama	bhavaśudhi		kit́a	ñata

G.—	vadad́habhatitá	cha	nichá	bád́ham.
D.—			niche	b*au*d́ham.
K.—	niva bhatita		niche	pad́ham.

---

[*] The alphabet given in the plate is not perfect, some letters in the large inscription still remaining doubtful; the single complete impression taken by Mr. Masson, and the damaged state of the rock, render that part much less legible than the small inscription; and some letters, or combinations of letters, have not yet been identified. The unmanageable size of the copy renders examination difficult; but it is being reduced for the lithographer, and the remaining letters will in all probability be identified before the appearance of the next Number, in which the whole of the Inscription will appear.

NOTE BY THE DIRECTOR.

The discovery announced in the foregoing notice by Mr. Norris is an unexpected and interesting accession to our knowledge of the Palæography and ancient history of India. There can be no doubt of the essential identity of monuments preserved through many centuries, by being inscribed on columns, or on rocks, in the most various and distant parts of the country; at Delhi, at Allahabad, in Behar, Cuttack, and Guzerat, and finally, in Afghanistan; originating with the same prince, and composed in the same language, with no other varieties than such as might be expected from difference of situation and defects of workmanship; curiously diversified, however, in the last instance, the case now under contemplation, by the use of a totally different alphabet, one written from right to left instead of from left to right, as in all the other inscriptions in India Proper, and corroborating the cotemporary currency of two sets of characters in the districts on the north-west frontier, of which we have had examples in the coins of Eukratides and Agathokles.

The concurrence of general purport which associates the inscription at Kapur-di-Giri with those of Dhauli and Girnar, as well as the light which they reflect upon the internal condition of India, and its relations with the neighbouring states, particularly with the Greek princes whose names are specified, will come most conveniently to be considered when the whole of the newly decyphered record shall have been prepared for the press. At present, it will be sufficient to offer a few observations on that portion which is now published, and which corresponds with the seventh Tablet of the Girnar and Dhauli incriptions, as decyphered and translated by the late Mr. James Prinsep, in the Journal of the Asiatic Society of Bengal, for March, 1838.

The inscription opens with the phrase which introduces all the rest, whether on columns or on rocks, *Devánámpriyo,* "the beloved of the Gods;" differing however from the rest in making the second member *Priyo* instead of *Piyo,* corresponding in this and other examples of the use of compound consonants more nearly with correct Sanskrit than with any of its Prakrit modifications. The termination of the singular nominative masculine in *o,* before a following hard consonant, is, however, the usual Prakrit inflexion.

The name of the king is next given *Priyaśi,* but as in every other inscription it occurs *Piyadasi,* and as the former would bear no known signification, while the latter is evidently the same as the Sanskrit *Priyadarśi*, "the kind or pleasant-looking," we cannot hesitate to regard *Priyaśi* as a blunder of the workman who cut the letters in the rock. Who *Priyadarśi* was seems to be still open to doubt, notwithstanding his supposed identity with *Asoka*. This identification still rests upon a solitary passage in a rare manuscript of an almost unknown Buddhist work, the Dípawanso, of which a copy brought to Ceylon from Siam, was procured by the late distinguished Pali Scholar, Mr. Turnour. In that passage it is stated, that the inauguration of a prince named *Piyadasana* took place in the two hundred and eighteenth year after the disappearance of Sákya, and that he was the son of Bindusara, and the grandson, or as the unamended original has it, the grandson of the grandson of Chandragupta. The date and descent of *Piyadasana* sort well enough, it is true, with those ascribed to *Asoka*, in both Brahmanical and Buddhist traditions, and the circumstances of *Asoka's* conversion to Buddhism, the great zeal said to have been manifested by him in the extension of that faith, and his erection of innumerable pillars and temples, at least according to the chronicles of the Buddhists, would not be incompatible with the tenor of the edicts decyphered, and the number of places in which they are found. At the same time, it is rather inexplicable why the name *Asoka*, an appellation much better known than that of *Priyadarsana*, should never once occur. There are also chronological inconsistencies between the probable date of a grandson of Chandragupta and of Antiochus the Great, who is named in the inscription, and must have been either anterior to, or cotemporary with the author of the edicts. We need not however dwell upon these difficulties at present.

The title *Rajo* corresponds with the reading of the Girnar Tablet, whilst the inscriptions of Delhi and Cuttack have *Lája*, a mere vernacular variation. In *savatra ichhati*, "everywhere desires," the first word is nearer to the correct Sanskrit form *sarvatra* than the *savata* of Girnar. Mr. Norris has had access to different transcripts of the latter, to a fac-simile on calico belonging to the Society; a copy taken by Captain Postans, in the possession of Mr. H. T. Prinsep; another of an earlier period belonging to Mr. James Prinsep, and the copy printed in the Journal with corrections made by Mr. J. Prinsep, but of which the publication was prevented by his lamented death. A copy also taken by Captain Jacob and Mr. Westergaard, a distinguished traveller and Sanskrit scholar, has been published in the Journal of the Bombay Branch of our Society, for April, 1843. No material deviations from the copy printed in the Journal of the Bengal Asiatic Society, by Mr. J. Prinsep, occur, but occasional varieties are met with; one of these was *ivati*, as first read in the Girnar Tablet, but Mr. Prinsep corrected this to *ichhati*, and Mr. Westergaard gives the same reading. Their accuracy is confirmed by the Kapur-di-Giri inscription, in which the word is clearly *ichhati*, "he, the king, wishes or wills."

The words which are next given, as *Sava páshanda vaseyu*, translated by Mr. Prinsep "all unbelievers may be inclined to, or brought to," cannot be quite so readily recognised. The Girnar Tablet has *save*, which would more accurately represent the Prákrit plural of *sava*, "all." The mark denoting *e* is however easily obliterated, and the reading here may also be *save*. The use of what appears to be the cerebral sibilant in *páshanda* is correct Sanskrit, whilst the substitution of the dental *s* in the Girnar version, is neither Sanskrit nor regular Prákrit; all want however a termination here to denote whether the word *pashanda* be singular or plural. The chief difficulty however lies in the term *vaseyu*. It is clearly enough *vaseyu* in the Girnar Tablet; it is indistinct in the Dhauli inscription, and rather questionable in that of Kapur-di-Giri. Even, however, if the accuracy of the form be admitted the signification remains uncertain. Mr. Prinsep's Pandit supposed it to represent the third person plural of the potential mood of *vaś*, "to wish," or more usually, "to bring under subjection." This verb is written with the palatal sibilant, which is a letter of the Kapur-di-Giri alphabet also, yet the sibilant here employed is the dental. The Sanskrit form would also be *uśyu*, not *vaśeyu*, and the inscriptions usually conform to Sanskrit in the verbal inflexions which they contain. If it be part of a verb, therefore, it must be derived from the verb *vas*, with a dental sibilant, meaning "to dwell or inhabit," and the sentence will be, "may all the unbelievers abide." The following words, however, scarcely admit of this interpretation.

These are, according to the three several inscriptions, *save te*, *ti save paga*, and *save ite*; they are all doubtful; the second is unmeaning; the other two may be intended for *te save*, "they all," but they would then seem to be superfluous.

We have next, severally, *sayamancha bhávasuddhincha*, *sachhaman bhávasuddhícha*, and *sayaman bhavasuddhicha*. Mr. Prinsep's translation, including what precedes, is, "The king desires that all unbelievers may be brought to repentance and peace of mind;" but *sayaman*, "with moral merit," would not be a substantive but an adjective, or an adverb, and *bhávasuddhi* is purity of nature rather than peace of mind. The first may possibly be intended for *sanyama*, which means moral control; but the nouns could scarcely be objectives governed by the intransitive verb *vasa*, "to abide," any more than by *vaś*, "to subdue."

In the repetition of the verb *ichhati,* "wishes," as it occurs in the Girnar Tablet, Mr. Prinsep had no other singular nominative for it than *Raja,* and he renders it accordingly "He is anxious." The present inscription furnishes a somewhat different reading, concurring apparently with that of the Dhauli rock, and gives the verb in the plural, *ichhanti,* "they wish," as if governed by *save te,* "they all," that is, all the *Páshandas.* This verb again may govern the nouns which precede it in the accusative case, although the second term has the sign of the case and is written *bhávasuddhin,* in the Girnar Tablet only.

The Kapur-di-Giri inscription agrees tolerably well in what follows with that at Girnar, substituting *cha,* "and," for *tu,* "but," as, *Jano cha uchávacha chhando uchávacha rago.* The Dhauli inscription has *Munisa* for *Jano,* a possible corruption for *manushya,* Sanskrit, "man," and the same therefore with *jano,* "man, or mankind." Mr. Prinsep translates the terms, "every diversity of opinion and every diversity of passion," a rendering which cannot be acquiesced in. As far as the words may be regarded as correctly decyphered, they would seem to express a general remark: "men or mankind are of various (high and low) wills—of various (high and low) passions," rather than a desire that they should be all of one way of thinking.

Te savam are the next words in all three. The Girnar Tablet has next *vakásanti;* the other two have only *va.* In some of the transcripts of the former the word is *vakásati;* but if the nominative be *te,* "they," the latter, which is in the singular, must be incorrect. There is no necessity to impute a defect to the other two inscriptions, if we suppose *va* to be properly *vá,* "or," the use of which obviates any occasion for the actual reiteration of the verb *kásanti,* as it occurs in the Girnar Tablet.

We have next in the Girnar Tablet *ekadesam cha kásanti* (or *vakasata* or *vakasati*), in the Dhauli inscription *ekadasa chati,* and in that of Kapur-di-Giri, *ekadesam va pi káshanti.* The Dhauli inscription is defective; the two others nearly agree. Mr. Prinsep's translation, in continuance of the preceding and immediately succeeding sentences, is, "he is anxious that every diversity of opinion," &c., "may shine forth blended into one system, and be conspicuous, in every undistinguishing charity," this translation depending on the meaning of the verb *kás,* "to shine." But this version takes no notice of the contrast presented by *savam,* "all," and *ekadesam,* "a part;" and it is not at all certain what the verb should be. *Kás,* and *kás* with a long vowel and a final palatal or dental sibilant, have, it is true, one of their meanings, "to shine;" yet this is in a literal sense, and they could never be the equivalents of "being conspicuous." In the present inscription also the verb is written with a short vowel, and the cerebral sibilant, as *kash;* and *kash* in Sanskrit means "to kill." It may also fitly represent the Sanskrit *krish,* or *karsh,* "to draw or attract." The translation suggested to Mr. Prinsep by his Pundit cannot therefore be relied on.

The present inscription supplies a necessary correction of the word that follows. The Girnar Tablet was read by Mr. Prinsep *visule,* with the remark that the second syllable was doubtful. The Dhauli reading is *vidala,* which did not tend to clear up the perplexity. In Mr. Westergaard's copy of the former the word is *vipule,* and this is now established by the Kapur-di-Giri inscription. The whole phrase in the latter is *vipule pi cha dane;* in the former tablet it is *vipule tu pi dane,* in which *pi* for *api,* "indeed," seems to be transposed. In Mr. Prinsep's translation these words were connected with the preceding, as in the passage already cited, "in every undistinguishing charity;" but whether we read *cha* or *tu,* "and" or "but," the particle separates the sentences, and detaches "gift" from any government of the verb *kásanti,* even if such connexion were syntactically accurate, which it is not. We must understand *dane,* therefore, as standing alone, being in fact the ablative absolute, and render the phrase in a sense which admits of no question, "but great gifts being given," or "where there is great munificence:" this will also connect well enough with what follows, "he of whom there is not moral restraint and purity of disposition," *yasa nasti sayama bhavasuddhi,* which is the reading of both the Girnar and Kapur-di-Giri rocks. The Dhauli inscription is evidently incorrect, but in using *nat'thi* in place of *násti,* it only substitutes the Prákrit form of the verb for the regular Sanskrit which is employed by both the others.

In the Girnar inscription we have next *tiva,* or *táva;* the former is unmeaning, the latter might be intended for *távat,* "so far," "inasmuch as;" the Dhauli inscription has in place of it *cha,* "and." There is no word in this place in the Kapur-di-Giri inscription; the sense seems to require some term that might be the correlative of *yasa,* "whose," as *tasa,* "of him." There is a blank in the following part of the Dhauli inscription which the other two agree in occupying with *katam-jn'atá,* or *kita-jnata;* both intended, no doubt, for the Sanskrit *kritajnatá,* "gratitude," not as the Pundit proposed to Mr. Prinsep, "supreme wisdom." The whole of the translation given in the Journal is here evidently very far wide of the truth, although it may be admitted that it is not easy to suggest a better, for all the rest of the original presents in either of the two most perfect inscriptions, a passage which cannot be satisfactorily interpreted, or even read with any degree of confidence.

The syllables that complete the portion of the inscription under review are in the Girnar version *vadádha-bhatita* (or *vadavabhatáta*), *vanivá-bádham* (or *che-ni-cha-dhanám*), for all which we have at Dhauli but *cha-niche badham.* The Kapur-di-Giri inscription conforms more nearly to the first, and has *niva-bhatita-niche-pádham,* a combination equally perplexing. We have first to determine how these syllables shall be divided into words, and then what the words signify, but I must confess myself unable to fulfil the first part of the condition, and as I cannot propose any satisfactory words, of course I suggest any interpretation as mere matter of conjecture. It may be thought that, as they are probably connected with *krita jnatá,* "gratitude," they may import that the acknowledgment of munificence will overlook want of moral desert, even in the base, *nicha* signifying "low," or "vile." The last word in the Kapur-di-Giri inscription, *pádham,* may be the equivalent of the Sanskrit *prathama,* "first;" or it may be intended for *prashtham,* "asked." The former would apparently lead naturally into the next or eighth portion of the inscription, which begins, according to Mr. Prinsep, "in ancient times," and not as usual, with *Devanam piyo.* It seems not improbable that the sentence does not terminate in this portion, and that either something is wanting, or that it leads into the next; at any rate, it is quite impossible that the concluding sentences of the seventh Girnar Tablet should admit of the translation of the Journal: "Unto no one can be repentance and peace of mind until he hath attained supreme knowledge, perfect faith, which surmounteth all obstacles, and perpetual assent." Mr. Prinsep states his dependence upon his Pundit for the interpretation of the documents, and although Kamala Kánta, by whom he was assisted, was a man of great learning and ability, yet the inherent difficulties of the task were more than he could overcome, and he was obliged to make up by ingenious conjecture for the deficiency of his knowledge and the imperfections of his text.

Although I cannot pretend to offer a translation of this part of Priyadarśi's proclamations which shall not be as liable to exception as that of my old and esteemed acquaintance Kamala Kánta, who is no longer living to vindicate his own work, or retaliate upon mine, yet it may be convenient to put together the results intimated as possible or probable in the foregoing remarks, if it were only to render them more amenable to criticism. I venture, therefore, to suggest the following as something nearer to the purport of the original than the former translation.

"The beloved of the gods, the Raja Priyadarsi, desires that all unbelievers may everywhere dwell (unmolested), as they also wish for moral restraint and purity of disposition. For men are of various purposes and various desires, and they do injury to all or only to a part. Although, however, there should not be moral restraint or purity of disposition in any one, yet wherever there is great liberality (or charity), gratitude will acknowledge merit even in those who were before that reputed vile."

Whatever may be thought of the exact rendering of this part of the inscription, it seems very likely that the Raja intended by it to recommend his own example to his subjects of every denomination in every part of India, and to encourage them to imitate him in the construction of works of public ornament or utility, and in the distribution of charitable gifts.

GEOLOGY OF SOUTHERN INDIA.

The following Notes have been received from Captain Newbold since the printing of the earlier pages.

Note to Paper on Diamond Sandstone and Limestone (pp. 156—171).

The following note is from Mr. Piddington on a mineral recently discovered by Captain Newbold in the shales of the limestone of Gazopilly Eastern Ghâts, associated with galena, quartz, calcspar, and sulphate of barytes:

"I have the pleasure of informing you that your red mineral is, as you supposed, an ore of cerium; and moreover, of that most rare kind, carbonate of cerium. It contains iron, lead, lime, silex, alumina, and perhaps, yttria and magnesia."

Additional Note to Paper on Trichinopoly Fossiliferous Limestone (p. 218).

Since my first paper on the Trichinopoly fossiliferous limestone, Captain Lawford, of the Madras Engineers, has kindly examined for me, more accurately, the limits and geological relations of these beds, and I have much pleasure in forwarding the following abstract of the notes he sent me, as a valuable *addendum* to the paper alluded to, with a few brief remarks of my own.

It will be right to premise that these notes commence at the N.E. extremity of these beds, following the strike of their stratification in a S.W. direction from the south bank of the Vellaur towards the valley of the Coleroon.

Keranoor, Olapaudy, and Varagoor.—Proceeding easterly along the right bank of the Vellaur from Keranoor, a tappal station on the Madras road about forty miles road distance N.N.E. from Trichinopoly and Vudakaloor, where a deep black soil covers the rocks, hornblende schist is the first rock seen, and hornblende rock in loose rounded blocks; they occur a little to the south of the Chennaur, a tributary to the Vellaur. The hornblende schist is in nearly vertical strata running east and west, and forms the base of a gentle acclivity in which were first seen the beds of fossiliferous limestone, which is found about four feet below the surface. The upper soil is a light brown mould containing much kunker, which also encrusts the limestone. The dip of the latter is towards the south, at an angle of ten degrees; the thickness of the beds could not be measured, but the height of the ground may be about one hundred feet above the stream. Proceeding south-east from Olapaudy, Captain Lawford passed along the western base of this acclivity, and still observed the hornblende as the underlying rock. In some quarries in the limestone, from which blocks nine feet by two and two feet and a half were being cut, the stratification was very distinct: dip and direction as before. Three feet below the surface was a layer of limestone with fossils nine inches thick, overlying a layer three or four feet thick of friable calcareous earth (marl), in which no fossils were observed, and which intervened between the upper and lower or main fossiliferous beds; immediately below the latter was the hornblende. About a mile farther the ground declined gradually to the south, and the soil became black alluvium. Three miles farther small rounded blocks of hornblende were seen: and at Varagoor, where the Olapaudy high ground terminates, were some rounded blocks of the fossiliferous limestone embedded in kunker in the bed of a stream.

From Varagoor to Shantanoor.—From Varagoor to the S.E. much hornblende rock was observed; and at three miles' distance, on another rising ground, the black limestone embedding great quantities of shells was met with. Black soil and hornblende rock succeeded as far as the bed of a stream, where rounded blocks of the fossiliferous limestone were found embedded in sandstone. Dark alluvial soil continued to Shantanoor.

Garoodamungalum ridge.—From Shantanoor the country continued of the same character as before. At five miles the fossiliferous rocks were observed in the bed of a stream: dip and direction as before. A fossil nautilus was found here. From this stream the ground rises to the S.E., and a ridge of fossiliferous rocks runs due north and south as far as the eye can reach. They formed the eastern slopes of the acclivity, on the top of which stands Garoodamungalum, on a sort of plateau, the western slope of which consists of a ridge of rocks, parallel and similar to the one above mentioned. This plateau and the ridges of rock were described to Captain Lawford as extending about five miles to the south and as many north. The rocks are a blue fossiliferous limestone: dip and direction as before, soil reddish brown.

To Pervullapoor.—Continuing south, hornblende rock and the limestone were seen occasionally; but the fossils gradually disappeared, and the last limestone noticed was at Pervullapoor, where it is yellow, schistose, and without fossils.

South base of the Fossil Tract and Valley of the Coleroon.—Beyond this, trap (basaltic greenstone) and quartz prevailed, and in another high ridge running east and west, overlooking the Coleroon, gneiss and granite. The great valley of the Coleroon and Cauvery, watered by numerous divisions of those rivers, is covered with a rich alluvium, which probably has its basis on the granite and hypogene rocks. Granite is seen on the opposite bank near Trichinopoly, occasionally overlaid by laterite, and occurs in the rock-islands in the river bed.

Western flank of the Fossil Tract.—At the western base of these fossiliferous ridges, along the line of Madras road, from the alluvium of the Coleroon on the south, to Keranoor on the Vellaur (whence we started) on the north, granite is seen between the Coleroon and Samiaveram. The soil is red, with much quartz and occasional rounded blocks of trap; between Samiaveram and Siriganoor, black cotton soil appears covered with much loose stone, chiefly trap and quartz; beyond the last place is a plain of deep cotton soil, succeeded by soil containing much kunker and loose trap.

About Ootatoor the rock is exclusively hornblende, rounded blocks of which literally cover the ground and form small eminences; hence to Toramungalum hornblende is the only rock visible, with abundance of kunker; the soil chiefly black alluvial. The same continues to near Volconda, where a calcareous schist is observed, and also magnesite; the latter in loose nodules and masses embedded in the soil; hornblende prevails also. The schist has a direction N.E. and S.W.: dip about twenty degrees. From Runjanguddy to the Chennaur, near which we started, hornblende rock continues with much kunker, and is seen in the bed of the stream; thence to the Vellaur, a plain of deep black soil extends, above which little rock is visible.

Such is the drift of Captain Lawford's notes on these interesting and partially explored deposits, which have been now traced so far south as the north edge of the Coleroon valley. It will be seen that if a line be drawn from this S.W. point at Pervullapoor, through the major axis of these deposits, it will pass in a N.E. direction through or very near to those of Verdachollum and Pondicherry, comprising a direct distance N.E. of about one hundred miles. On referring to the Map we shall find that the larger gaps which now separate these deposits, are occupied by the valleys through which flow the principal rivers of this part of India to the Bay of Bengal, viz., the Panaur and Vellaur. Whether the valley of the Coleroon separates the Trichinopoly deposits from others still further to the south or S.W. at intervals to Cape Comorin, remains still to be shown, or whether they here terminate or have been swept off by denudation. It seems probable, that though there may be differences in the ages of the fossiliferous strata, they once formed a continuous ridge, or parallel ridges, elevated gradually with the land from the bed of the sea to the different conditions of a sea beach, and subsequently of a coast ridge, and that the gaps we now see in their continuity, inexplicable by the supposition of the eroding powers of present streams, were formerly the sea embouchures of ancient lines of drainage, the directions of which have since but little changed.

The present height of the fossil beds above the Coleroon Captain Lawford states to be about two hundred feet, and that the surface of its area is undulating. The unconformable and smaller amount of dip relatively to that of the hypogene rocks on which they immediately rest, shows that the former had suffered great disturbance prior to the deposition of the limestone: but it is evident that the latter has partaken of the later disturbances which have affected the hypogene rocks, and lastly has been raised with them from the ocean's bed.

Fossils collected from the upper layer, described by Captain Lawford as separated by a non-fossiliferous stratum from the lower beds, should be kept distinct, as it is possible they belong to distinct epochs.

ART. XVI.—*Analysis of the Ganeśa Purána, with special reference to the History of Buddhism. By the* REV. DR. STEVENSON.

[*Read January* 4, 1845.]

THINKING that the Gańeśa Puráńa might throw some light on the origin of the Saiva worship, I lately took it up to examine it in that relation. I had not proceeded far in this investigation before I was fortunate enough to meet with two legends, which I conceive have a distinct reference to the rise and fall of Buddhism in India. One of these is contained in the first, and the other in the second khanda or division of the Puráńa; and to their consideration I shall devote this paper, after a few brief general remarks on the work itself.

The former called the Upáśana Khańda of the Puráńa, could scarcely have been written before the seventeenth century of our era, as Moreśvar (*Sans.* Mayúreśvara) is mentioned as a great Tírtha of Ganeśa; but till Morabhatta, who flourished in the former part of that century, gave it celebrity, and originated the Chinchore (Chinchvad) incarnate Gańapatis, it was a place altogether unknown to fame.

The Puráńa commences with the misfortune of Somakánta, king of Surat (*Sans.* Sauraráshtra), who, on account of the affliction of leprosy, left his home and kingdom to wander in the wilderness. While roaming about from place to place, he came in contact with the sage Bhrigu, one of his progenitors, who retailed to him what Brahmá had in ancient times related to Vyása in praise of Gańeśa. The sum of the whole is, that Gautama, Saubhari, Kaundinya, Viśvámitra, and all the Rishis, recommend to sundry applicants for ghostly advice the worship of Ganeśa, and the repetition of the two *mantras*, the one, *Sri Ganeśáya namah*, and the other the mystic *Om.* Indra, Siva, Vishnu, Paraśuráma, Skanda, &c., are all represented as having failed in their projects till they applied to Gańeśa, through whose aid alone they were enabled to perform their exploits. Bhrigu, therefore, in conclusion, sends away his pupil Somakánta to get rid of his disease, the consequence of sins committed in a former state, by worshipping Gańapati on the 4th of Bhádrapad, according to the institute in which he had instructed him.

The second Khańda of the Puráńa refers to the first, and therefore must have been written after it. Súta is there introduced as relating to the assembled sages what Bhrigu had rehearsed to Somakánta, and Brahmá originally narrated at the request of Vyása. To extol